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AMERICAN ENAMELLED BRICK.

A paper read at the Annual Convention of the National Brick Manufacturers' Association.

Gentlemen of the National Brick Manufacturers' Association:

I HAVE been assigned the subject of "American Enamelled Brick," and I will endeavor to handle it from a practical standpoint, to the best of my ability, and in as short a manner as possible.

I will not attempt to deal with the history of the enamelled brick industry, except so far as is necessary to make my article clear and intelligible. Until within very recent years the usual method of enamelling brick in this country has been to cover the face of the brick with an opaque enamel, commonly called a "true enamel."

Within the last six or eight years the English, or slip-and-glaze, method has been adopted by a few manufacturers.

I will endeavor to contrast the products of the two processes, and then give you my views concerning the method followed by my own firm, and trust that I will be able to make my meaning clear, so that those who intend to engage in this industry may be able to use my advice intelligently, whether it meets their own particular views or not.

I will first take up the subject of enamelled brick, and will briefly set forth the facts which led us to adopt the other method. I will state frankly that I do not claim to be an expert in the true enamel line, and will not attempt to go into a discussion of the methods employed for fear of giving you false information, or misleading ideas.

Before we engaged in this business we, of course, examined all the available enamelled brick jobs in our immediate vicinity. We found the majority of them laid up in brick of domestic manufacture. In most cases they were red brick, enamelled. The contrast between the domestic brick and the imported article was marked, and, while both had their defects, the imported brick were far superior to those of home manufacture.

We found the English, or glazed, brick more uniform in color, and also that they withstood the hardships to wish they were exposed much better than the enamelled brick. I have seen some very handsome samples of enamelled brick, and must confess that the manufacturer of enamelled brick can turn out some samples that in many respects are much more handsome in the hand than those of his glazed brick competitor; but when it comes to a laid-up wall I have failed to find a single instance in which the general appearance of the wall was not in favor of the glazed brick. Both classes of brick craze to a certain extent, both will peel, and both will vary in color.

In the glazed brick we found these defects less frequent than in the enamelled brick. The enamelled brick presents the more glossy surface, but the glazed brick gives the more level face. In the enamelled brick you must necessarily have a more or less rounded corner on the enamel. The reasons for this are its extreme fusibility and the thickness of the coating required to hide the face of the brick.

The cause of the rounded edge on the enamel is found in the fact that any molten material cannot be caused to flow out squarely to a square edge, any more than could so much water, or other liquid.

In the glazed brick this defect, while it exists to a slight degree, is not noticeable unless attention is called directly to it.

The slip with which the face of the brick is covered, being infusible at the heat required, will stand up square and true along the edge. The glaze, being thin, cannot present this defect in any marked degree, though it can be detected by close examination.

The making of returns or corner brick also presents some difficulties that are patent to all who see fit to examine brick of this class.

In all enamel brick that have come under my notice I have seen very few in which the edge and end were of exactly the same color. These facts led us to adopt the slip-and-glaze process, and so far we have had no cause to regret our choice.

From information I have received I have been led to believe that the manufacture of enamelled brick is attended with more difficulties than that of glazed brick, and what experience I have had in the business seems to verify it. I will now drop the subject of enamelled brick and leave all discussions as to their merits and demerits to those who are more competent of discussing them; but the facts which I have stated can, I presume, be verified in almost any one of our large cities by any one interested. He will have enamelled brick and enamelled brick, and glazed brick and glazed brick, some better and some worse; and from the appearance and apparent durability of the material he can draw his own conclusions. Poor glazed brick are very poor; poor enamelled brick are in the same boat, and he will find many of each class upon which to pass judgment.

In the manufacture of glazed brick the most essential point to decide is that of a suitable clay. To produce a good article it is necessary that the clay should stand a fairly high degree of heat without warping or twisting, and as the heat required is very near, if not quite, the melting point of cast iron, it is obvious that iron in those forms in which it would be likely to cause spots on the face of the brick is very injurious, and, unless it can be easily gotten rid of, will ruin any clay for enamelling purposes. An excess of lime will also give trouble. I presume you are all acquainted with the effect of pebbles containing lime, and further comment is unnecessary. When iron or lime is combined with, or evenly diffused through, the clay, they are not nearly so objectionable, though not desirable. They are both fluxes at the heat mentioned, and if lime is counteracted by an excess of finely divided or combined silica, we can stand more of it than we can in highly aluminous clays. If the clay contains too much alumina, it is apt to cause "crazing," and also to cause glaze to "curdle" or draw up.

Too much combined or very finely divided silica will cause what is known as "shivering."

In the case of "crazing," the body of the brick is too strong; and, in the case of "shivering," it is too weak.

When the silica contained in the clay is partly combined in the

shape of comparatively coarse particles or stones, it will do no harm unless greatly in excess, provided it is finely ground before use.

The shrinkage of the clay is also an item to be considered. This can be regulated by the addition of finely ground burned clay, known as crush, grit, or grog. Never use sand to lessen shrinkage. Its use is very dangerous, and is liable to cause peeling, while crush will be found to be very reliable. All crush should be finely ground. Coarse crush, while it will answer the purpose better probably than fine, will give a wavy appearance to the face of the brick, owing to the fact that the clay will shrink in burning, while the crush will not; and those particles near the face of the brick will hold it up at that particular point and cause a slight elevation there, which will render the effect of reflected light anything but pleasant.

In my own experience I have never seen any single clay that I could unhesitatingly recommend for the manufacture of glazed brick without the addition of a clay of a different nature, or some material to give it either the proper chemical or physical characteristics. It must possess certain physical characteristics in order to admit of the manipulations necessary to product the article economically. So far I have never succeeded in successfully treating a dry or semi-dry brick by this process. I must admit, however, that when one does happen to turn out a good sample of semi-dry glazed brick it is very handsome. But we found the percentage of good brick very low, and consequently have abandoned it.

Hand-made, soft, or stiff mud brick are best adapted to this process, and the clay must, of course, be adapted to one or another of these methods of manufacture. This will, of course, determine the physical characteristics of the clay so far as the making of the brick is concerned.

I take it for granted that all of you can determine the physical qualities necessary for these processes, as well as for the following process of pressing.

When this is satisfactorily disposed of, the question of contraction in drying of slip, glaze, and brick must be considered. If both the slip and the glaze are applied to the brick when dry, this question needs no consideration here, but must be considered when slip and glaze are prepared, and they, not the body of the brick, must be made to suit this particular case.

When slip is applied to the green brick immediately after pressing, it is necessary to use a slip containing a considerable amount of tough clay, in order to secure the proper working qualities, and here the question of contraction in both slip and brick must be considered. The brick in drying must contract enough to admit of the use of such a slip in order to give you a smooth face, clear of "pinholes" and other defects caused by the shortness of the slip.

So also must the contraction in burning be practically the same as the contraction of the slip. This difficulty can be conquered by alteration of either body or slip, or both, as may seem advisable.

It is in the kiln that the chemical defects nearly always show themselves, and the proportions of silica, alumina, and other elements which usually enter into the composition of the clay must be properly adjusted in order to insure success.

As before stated, an excess of alumina is not desirable. It causes warping of the brick, both in drying and in burning, and makes the body of the brick too dense for the proper application of a glaze.

The density and consequent strength of the body are the great sources of crazing, and, when this effect cannot be overcome by carefully burning, it will in all probability be due to an excess of alumina, or lime, or other fluxes in the clay. Alumina also gives a dull appearance to the glaze in many cases.

Silica causes shivering and peeling. Shivering and peeling are to a great extent the same defect, though they are produced by different causes.

Shivering is caused by an excess of silica alone, while peeling is produced by the same defect in the clay, but is, I think, developed in the worst form by an excess of silica together with an excess of fluxing elements, which attack and combine with a large percentage of the silica at a certain heat in the kiln, thereby causing a sudden shrinkage. This will cause a rupture between brick and slip, and develops peeling in its most aggravated form.

It is evident, therefore, that the most important matter connected with this method of producing glazed (commonly called enamelled) brick is a proper clay or mixture of clays; and, owing to the well-known fact that nearly all clays vary materially in different parts of the same bed, I would always advise, when possible to do so, the use of a mixture of two or more clays, as less liable to affect the body of the brick by simultaneous variation in their component parts.

To emphasize this, I will give the following facts: Analysis of a sample of one of the clays used by us showed, total silica, 79.15%; alumina and iron, 15.32%. Two months later the analysis of clay from the same bed showed, total silica, 69.26%; alumina and iron, 20.41%. Had we been depending on this clay alone, we would undoubtedly have gotten into serious trouble; but as we were using a mixture of clays it did not affect us so much. But at the same time its effects were very apparent in our brick, and, owing to this excessive variation in this particular clay, we were obliged to abandon it, though it had been giving us satisfactory results for more than a year. This variation was in both the combined and uncombined silica, and it happened to occur in just such a form that it was not noticeable in the working of the clay, and was not discovered until we found that our product was not up to its ordinary standard, and by that time we had several thousand brick in the kilns and in course of manufacture. While the loss in this case was serious, it was not a circumstance to what it would have been had we been using a single clay, and it had happened to vary so much in its chemical constituents. I give this experience in order to show the importance of having a constant body to work on.

Silica tends to brighten most enamels and glazes, while alumina is very apt to have an opposite effect. Variation in these two elements in the body of the brick will, therefore, destroy that uniformity of surface which is desirable in this class of brick, and no matter what process is used it will be found that the body will to a certain extent exert its influence for good or evil, on the face of the brick, be it glazed or enamelled.

In view of these facts I would strongly advise the intending enamelled brick manufacturer to use a mixture of at least two clays in such proportions as will give the desired result, and regulate the shrinkage by the addition of more or less fine-ground burned clay, which should be fine enough to pass through a sieve with a mesh not over one sixteenth of an inch square.

The amount of this material will depend upon its fineness, upon the toughness of the clay, and upon the result desired. The tougher the clay, the more crush it will carry, and the fineness of the crush used must be determined by the working of the clay. Make it as fine as you can to work properly both in drying and in burning.

It may seem superfluous to give so much space and take up so much time with what seems to be the only part of the business that would be understood by all of you, but it is the rock upon which more hopes have been wrecked than any other one thing connected with the glazed brick business. This is what usually floors our English cousin when he comes over here and attempts to work American clays.

This is what drives our American manufacturers into the devious ways of true enamels, double burnings, and other attendant evils. I do not mean to say that all ways leading to the use of true enamels are devious, but in my opinion the glazed brick will, when its necessary evils have been overcome, be found far more profitable to manufacture, when viewed from an economic standpoint, because it is usually more reliable, requires but one burning, and last, but not least, it sells itself.

Having given so much time to the body of the brick, we must necessarily cut the balance and least important part of our paper short.

A glazed brick is one whose face is covered by a colored slip. A slip is a mixture of the proper materials that is infusible at the heat employed in the glazing operation. The slip is covered by a substance somewhat of the nature of a glass that is more or less thoroughly fused. When this mixture becomes transparent or semi-transparent at the heat

employed, it is called a glaze. When it remains opaque, it is called an enamel.

To be called either a glaze or an enamel, it must present that smooth, glossy surface which characterizes these substances, otherwise to all intents and purposes it remains a slip at that particular heat.

I make this statement to show the relation between these technical names, that we may not be confused by subsequent discussion which may arise. Therefore, it will be understood by all that when the word "slip" is used it means a mixture that is infusible at the heat used by the person who gives it that name.

An enamel is a substance that is more or less thoroughly fused but remains opaque at the heat employed by the person who gives it that name. A glaze, on the contrary, is a mixture that becomes transparent or semi-transparent (whether colored or not) at the heat employed by the person who gives it that name.

Having now attempted to give a clear idea of what I mean by slips, enamels, and glazes, and prepared a foundation upon which, I think, we may all stand during any discussion which may follow, I will proceed with my subject.

Slips are prepared by mixing clay, flint, feldspar, and other substances in such proportions that they will adhere to the face of the brick both in drying and burning, and the proportions of the different ingredients must be suited to the work in hand. They must be infusible at the heat employed, yet must contain enough fusible material to enable them to adhere to the face of the brick. These proportions vary materially, and no recipe can be given that will meet all cases owing to the different conditions governing them.

At the heat at which I am accustomed to working clay, flint and feldspar are the only materials to be considered with the coloring matter. Others may find it necessary to use other ingredients, but if such is the case I would advise more heat and less soft materials. They are likely to give trouble in burning. Slips should be thoroughly mixed with water to the proper consistency and sifted through a sieve not coarser than No. 100 brass, and finer if possible. The slip is applied to the face of the brick by dipping, and should be as thick as is possible to use it and give a smooth face. Don't be afraid of its pulling. If it does, either body or slip is wrong. I have seen bricks with a quarter of an inch of fine clay on the face, though it was not put on in the form of a slip, and it was impossible to cause a rupture between brick and clay without breaking one or the other. This clay was stuck on to the brick by a coating of slip that was made of exactly the same ingredients as the clay. In fact, in every instance the clay was simply the slip dried until it could be handled, and stuck on the face of the brick with a coating of slip between the two. I do not recommend this at all as a profitable method to follow, but mention it to show what can be done if brick and slip are properly adapted one to the other.

When a slip is to be applied to a dry brick, it must be necessarily thinner than for green brick, and this method is not to be highly recommended owing to the difficulty of handling the brick during the succeeding operations of glazing, cleaning, and setting. A slip to suit a dry brick must be very short, and has as a consequence very little strength when dry, and is liable to be clipped in handling.

Glazes and enamels are composed largely of the same ingredients as slips, with the addition of suitable fluxing materials. At the heat mentioned it will be unnecessary to use soluble fluxes, and lead will be volatilized and dissipated, thus rendering its use unprofitable and inadvisable.

At lower heats lead can be used to advantage, but soluble fluxes are always dangerous in raw glazes or enamels, and, if used to any appreciable extent, frequently act on the slip, and in the case of the enamels on the face of the brick. Being soluble, they are carried by the water into the brick and are sometimes a prolific source of cracks. If soluble fluxes are necessary, they should be calcined or "fritted" with a portion of the other ingredients before they are used. This destroys their solubility and prevents danger from the source mentioned.

At the proper heat frit glazes will be found unnecessary, but there can be no question as to the advisability of using them should occasion demand it.

All glazes and enamels should be thoroughly ground and passed through a sieve at least as fine as No. 100 brass, and finer if possible. Glazes should be as thin as it is possible to use them and produce the desired result.

The same rule applies to enamels, but enamels must be thicker than glazes owing to the necessity of hiding the face of the brick with the one coat. In some cases it is necessary to use colored glazes or enamels in the slip-and-glaze method, but the coating of the slip should in no case be omitted, nor is it necessary to burn the brick twice in order to accomplish your object. It can be applied, when necessary, while the brick is green, and with just as good if not better results, as at any other time.

After the brick is glazed and dry it is necessary to take off the spare slip, glaze, or enamel along the sides and on the heads. This can be done with any suitable tool. The next and a very important operation is burning. The heat at which I am accustomed to work is about the melting point of cast iron in the cooler parts of the kiln.

It is necessary to use a crowned kiln to reach this heat successfully and economically.

The method of setting varies, some setting the bricks open, in which case down-draft kilns are a necessity. Others use saggers, when up-draft kilns can be used, but the down-draft kiln properly constructed will be found most economical. In my own experience I have found saggers, all things considered, most economical, but have always understood that English manufacturers burned their brick open. The operation of burning does not differ very materially, except in some minor details, from that employed in burning other clay wares.

The brick must be dried out gradually until the kiln is red hot, or nearly so, from top to bottom, when a quick finish produces the most brilliant glaze.

The cooling operation should receive close attention, as quick cooling and light firing, either separately or together, are prolific sources of crazing. The bricks, if properly annealed, will not craze if body, slip, and glaze, or enamel, are properly suited to each other.

I have taken up a great deal of time, yet I have only skimmed over my subject. There is so much to say and so little space to say it in that I feel many of you will feel disappointed, but not more so than I am myself at the meagreness of the information given as compared with the time occupied.

Phœnixville, Pa. JOSIAH MILLER.

GLAZED BRICK: THEIR ORIGIN, VALUE, AND USES.*

A PAPER READ BEFORE THE NATIONAL BRICKMAKERS' ASSOCIATION AT ITS EIGHTH ANNUAL CONVENTION, CONVENED AT CHICAGO, JAN. 2, 1894.

ABOUT 300 years ago a man who might well be canonized as the patron saint of workers in clay wrote, "The number of my years hath given me courage to tell you that, a short time since, I was considering the color of my beard, which caused me to reflect on the few days still remaining before my race should end; and this made me admire the lilies and corn in the fields, and several sorts of plants, which change their green color to white when they are about to bear fruit. Thus, also, certain trees burst into flower when they feel that their natural vegetative vigor is like to cease. . . . Wherefore, it is a just and reasonable thing that each should endeavor to multiply the talent which he hath received from God. . . . Therefore have I endeavored to bring to light those things which it hath pleased God to make me understand, to the profit of posterity."

In these terms does a poor potter, nearly ninety years of age, express himself in the preface to his writings and conversations with

* In presenting what we have gathered for your consideration at this time, we desire to say that we are largely indebted to Alphonso De Lamartine, also to the principal manufacturers of glazed brick in England and the United States, and especially to Mr. Henry R. Griffen, late Superintendent of Griffen Enamelled Brick Company of Oaks, Pa., and Mr. E. Matheson, Managing Director of Farnley Company, Leeds, England, for the technical information offered.

himself, in which he treats of his trials, his afflictions, and his life, for his own amusement and for the encouragement of others. The passage might be taken for an extract from the confessions of St. Augustine, or of Jean Jacques Rousseau, or of a writer and philosopher, great both in ideas and in style. This writer, this philosopher, is but a workman who has grown old between the trowel and the furnace, with his hands still soiled by the clay that he moulded all his days. We never felt more strongly than in studying the life of this man, that greatness does not depend upon position, but is a gift of nature.

The potter was Bernard de Palissy (A. D. 1510–1589). While young he kneaded marl and burnt bricks at his father's kiln, in the village of Chapelle-Biron, in Perigord. But the youth was moved by that desire of doing well whatever we do, which leads the reflecting man to surpass what he sees done by others, and which, at length, gives him the key to all the discoveries in intellectual or manual labor. While moulding his coarse clay, and gazing on the brick that had become hard and red in the fire of the furnace, he was thinking of the forms, the reliefs, the handles, the ornaments, and the figures of the vases, which already presented themselves to his imagination, and of the glazes and enamels with which he was one day to cover his masterpieces of earthenware.

Pottery — that is to say, the business of tempering, moulding, and baking earth, either in the sun or in the fire — is one of the earliest of human occupations. The mud which retains the footmark offers itself naturally as an element ready either for the sport or utility of the first inhabitants of the earth. Vases and cups, to hold the liquids necessary to quench thirst, were used by man as a substitute for the hollow of the hand, as soon as he had left off drinking at the pool like the beasts of the field. An improved kind of earthenware, fit for cooking food, must have closely followed the invention of fire. From the first clay jar or earthen cup to the colored glaze of the Etruscan vases, the enamelled porcelain of China or Japan, or the indelible pictures fixed by fire on the surface of the fire ware of Sevres, we may trace each step of the immense scale which separates the rude handicraft from the exquisite art.

On the fall of the Roman Empire the art of tempering, moulding, ornamenting, sculpturing, varnishing, and painting earthenware disappeared with the other arts. Christianity at its commencement opposed all these as being too intimately allied with idolatry. Temples, statues, tombs, urns, vases, and pagan vessels,— it proscribed all, that it might model the world anew. The Greeks of Byzantium alone preserved some of the traditional processes of this art of their fathers, and exercised them at Damascus, the greatest manufacturing city of the Levant, and from which the glazed and painted vases were spread over all the world as articles of regal luxury. These wares were, however, clumsy and tasteless; they evinced the decay of an art that was lost. But while the West was successively creating, losing, and endeavoring to recover the art of pottery, the ancient nations of the extreme East had been, unknown to us, for thousands of years making that painted, glazed, and semi-transparent porcelain which has been for ages the delight of the Chinese and Japanese. They have reached such a perfection of material, form, and color that even to this day our imitations can hardly compete with them; and if artistic civilization were to be measured by superiority in the manufacturing of earthernware, the West must bow before the East. Even the most ancient annals of China mention as unknown the date of the invention of porcelain.

But these wonders of the extreme East were still unknown in the West in the fourteenth century. Glazed earthenware appears for the first time in the pavement of the Alhambra of Granada, and in the mosques of the Moors of Spain. The art was introduced into Europe through Arabia. It was not until a century later that the famous Luca della Robbia, the Palissy of Tuscany, became celebrated for enamelled earthenware in Italy. A moulder of clay, he succeeded, after persevering labor, in covering and varnishing his works with a white glaze unaffected by what destroys the surface of unglazed earthenware. The manufacturing cities of Florence and Faenza, from which last is derived the French word *faience*, owed to him their trade and their celebrity. Painting soon took possession of his enamel as of an imperishable canvas, and the pictures of the great masters were copied, fired, and made everlasting on these disks of porcelain. Sculpture endeavored to rival its sister art, and grouped its statuettes and bas-reliefs round the vases, cups, ewers, and plates of baked earthenware.

Such was the condition of the earthenware manufacture when Bernard de Palissy was making tiles, bricks, and earthenware bottles to hold water, wine, and oil.

Bernard de Palissy is the most perfect model of the workman. It is by his example, rather than by his works, that he has exercised an influence on civilization, and that he has deserved a place to himself amongst the men who have ennobled humanity.

He is the patriarch of the workshop; the poet of manual labor in modern days; he is the potter of the Odyssey, the Bible, and the gospel, the type incarnate to exalt and ennoble every business, however trivial, so that it has labor for its means, progress and duty for its motive, and the glory of God for its aim.

He has thus won a legitimate place among the great men who have risen from obscurity.

Some will say, "But he has only moulded clay." What can it signify? Greatness does not depend upon the occupation, but upon the mind. If such a man be little, who, then, is great?

Some thirty years ago the Farnley Iron Company, and one of its neighbors in business at or near Leeds, England, finding that the fire clay found in connection with the coal seams in that district was particularly suitable for allowing an enamelled surface, began the manufacture of glazed brick.

For some years after the trade was started the bricks made were very inferior compared with those of the present day; the best bricks of that day not being at all equal to what are sold as second quality now. Notwithstanding this, the bricks found immediate sale with architects, especially in London, where they were used, partly for sanitary reasons (the glazed surface being washable and non-absorbent) and partly for light afforded in narrow alleys and courts. As the quality of the bricks improved with the experience of the makers, the demand still further increased, and they are now used in large quantities in all English cities.

It is estimated approximately the total output capacity of the Leeds district is about four to five millions per week. Of these numbers, not more than sixty per cent can be reckoned on as first quality, and thirty per cent second quality; the remainder, as thirds, are available only as building brick. These thirds are valuable where strength is required; the superior clay and hard burning make them of high value, because of their resistance to crushing loads.

It is worthy of note here that, in placing enamelled brick where they are to be subjected to heavy loads, care must be used in setting, that the superincumbent force does not press on the outer edge of the brick, as the enamel will give way if more than its share of the load is imposed upon it.

Probably about one sixth of the product of the Leeds factories is shipped and used in America, where they may be said to be the *standard* for good, serviceable enamelled brick, and the excellent quality to which they have attained must be equalled by our American manufacturers before they can justly claim to have first quality glazed brick.

It is a pleasure to be able to state that at this time there are at least two American manufacturers who have nearly attained to the excellence of the best English makers; in fact, they do equal them in the durability of this product, their success in getting clays and glazes to fuse being fully up to the English; and the only difference in the American and English brick is that our manufacturers have thus far failed in finding a clay with all the necessary qualities that will, after burning, have a surface as smooth as is the product of our English friends.

The only American manufacturers who have thus far succeeded in making a thoroughly good and merchantable glazed brick from the standpoint of the English standard are the Griffen Enamelled Brick Company of Oaks, Pa., and Sayer and Fisher Company of New York.

The experience of our American as well as the English manufacturers in getting the manufacture of glazed bricks started on a success-

ful basis has been fraught with many sad experiences; and with them, as with the makers of other kinds of brick, the workings of clays and enamels have been "eye-openers," and in all cases success has only been attained at a great cost in money, and vexation of spirit.

There are various methods of glazing bricks: —

First, slipping and glazing while green, and then firing.

Second, enamelling green and firing.

Third, slipping green, firing, and then glazing and re-firing.

Fourth, burning, then enamelling, then firing again.

Fifth, burning, then clipping and glazing, then firing again.

The fourth and fifth methods avoid many difficulties of the first and second; the third method avoids about half of these difficulties.

The fourth method is both the best and poorest, except the fifth method; that is, the best brick can be made by that method, and the poorest are made, except those made by the fifth method.

A good fire-clay brick first burned, then enamelled with a good, high heat enamel, and reburned at a high heat, will make a brick that is absolutely indestructible, but the expense of the fire clay, added to the double burning, is too much.

The fifth method is very bad, because it is as expensive as the fourth, and not so reliable.

The third method is as good as the first, but as expensive as the fourth and fifth.

The second method is still more difficult than the first and just as expensive. It presents all the difficulties of the first with the added difficulty of iron spots developing in burning, due to enamel being directly in contact with the impure fire-clay face of brick.

The first method is, all things considered, the most practicable; still the difficulties to be overcome are enormous. First you have three different materials, a brick, a slip, and a glaze, which must all stand the same heat, and must all shrink alike during the whole operation; then you must have a mixture for your brick that will not shrink too much, or the brick will warp; it must not develop iron specks; must not blister in enamelling; must not pinhole; slip must stick to it well; must not shiver; must not craze; must not crack in pressing; must be strong; must cut decently; must not discolor the enamel or glaze: many clays are barred due to the last condition. Many clays that are good in other respects will crack in pressing; many will craze; many will shiver; many will warp; many will give iron specks, and very many will not properly hold the slip. Some will blister, and some pinhole.

The latter, blistering and pinholing, are largely a matter of manipulation, and some clays simply show a tendency which proper handling will overcome.

One successful manufacturer says, "I have handled in my experience over two hundred different clays, and I do not believe that there are more than five or six of them that are good for enamelled brick, though many of them might be used after much experimenting. There are very few clays which I would pronounce impossible to enamel."

The same manufacturer says, "Our process is to make the brick, press them, dip them in slip, then in glaze, and burn."

The English makers generally, Sayer and Fisher Company, and the Griffen Company, use process No. 1. We do not know of any one using process No. 2. Somerset uses process No. 3. Zanesville makers, Excelsior Stone and Brick Company of Philadelphia, and Matawan Company use process 4. Phillipsburg uses process No. 5. The principal difficulties with process No. 1 are cracking, crazing, shivering, and warping.

The principal difficulties of process No. 2, if used, would be the same with addition of uneven color, due to brick body showing through enamel, more on some bricks than others.

Process No. 3, the same as No. 1, except warping: warped brick can be rejected between burnings, but expense is added.

Process No. 4, crazing, shivering, cracking, and color of body showing.

Process No. 5. The tendency to pin in this process is so great that it condemns it without going into other difficulties.

An enamel is a translucent glaze, and never reached absolute opacity; consequently if over a colored body its color is dependent on thickness of enamel, degree of fusion, etc.

A slip is absolutely opaque, and hides body of brick entirely.

Glazed brick become a necessity in our cities, for area and alley walls, where light is desired; but their use in baths, cafés, smoking-rooms, fish and butcher markets, railroad stations, grocery and butter stores, stable walls, cold storage and brewery vaults, etc., etc., where cleanliness is requisite and the daily use of water a necessity, should speedily follow the experience in their favor in the older cities of the world. By their use sanitary satisfaction can be secured, and at the same time beautiful architectural effects accomplished.

One modern use in Europe, worthy of imitation in American cities, is the construction of underground urinals which, while avoiding any obstruction above the street lines, afford a clean, well-lighted convenience. American visitors to London will no doubt have noticed these places, all of which are lined with glazed bricks.

The size of English brick (3 ins. by 9 ins. by 4½ ins.) seems likely to become the standard size in this country for glazed brick, as they can be made English size at not over fifteen per cent above cost of American size. The English size brick gain about 33⅓ per cent over the American size in laying, besides being about $8 per 1,000 less expensive in labor and materials in laying. The English size brick at, say, $115 per 1,000 are cheaper for the contractor than American size at $68 per 1,000; also you will find that the larger surface of the English size gives a better effect and appearance to the wall when laid; and there are fewer joints to aid in gathering dust and soot.

Those who have to do with the building trades in our Eastern as well as in our Western cities, to any extent, seem to be satisfied with inferior grades of manufacture. This, we believe, to be a mistake, and especially so as regards all kinds of brick, including enamelled.

If the story of Palissy's trials (to be found complete in Lamartine's "Lives of Celebrated People") trying to bring to perfection the art of enamelling could do away with the spurious and inferior work, even in the enamelling of brick, his story has not been told in vain. We are building for time, not for to-day alone. America in her buildings should learn a lesson from the Old World on what we can do for posterity. It is not for the dollar that we may save in buying or selling a poor stone or poor brick. In every walk of life, in art, in science, and in trade, we hope that the bells that rung out the year 1893, and rung in the new year 1894, yet in its infancy, "rung out the false and rung in the true."

GEORGE B. ENGLE, JR.

Chicago.

HOW CAN WE BEST SECURE TRAINED HELP?

A PAPER READ AT THE EIGHTH ANNUAL CONVENTION OF THE NATIONAL BRICK MANUFACTURERS' ASSOCIATION.

I HAVE noticed in the columns of the *Clay-worker* during the past year, articles from several of the members of this association, in all of which the value of scientific training and special education for clay-workers has formed the theme. The point of view from which these writers look at the subject (R. Brick–D. Crossley) is naturally different somewhat in each case. Some recommend the use of the present educational apparatus of the country, and others think that better results would be had by establishing practical schools on the manual training system. But in all cases a substantial unanimity of opinion prevails on one thing, and that is the ability of science, and especially chemical science, to help the clay-worker in his daily work.

During the summer of 1883, and again in 1892, it was my fortune to be employed by the State Geological Survey of Ohio in investigating and preparing a report on the condition of the clay-working industries of that State. In the course of this investigation, I was, of course, thrown into intimate relations with the workers of all branches of the ceramic art, and thus had usually favorable oppor-

tunities to find out what the status of the clay-workers was in regard to the scientific aspect of their business.

It was a surprise to me in my first trip to find the use of chemical or other scientific information so small, but after nine years had passed, and I again made the rounds and observed the wonderful expansion and increase in prosperity, and the distinct but less visible improvement in the quality of the wares manufactured, I was, indeed, amazed to find that very little, if any, change had taken place in regard to the use of chemistry or other technical knowledge.

There are, perhaps, several principal reasons for this fact: first, I think, is the misapprehension which I find exists very generally among the clay-workers as to the way that chemistry or science can be employed in their business. Most of them think that what is recommended to them means that they shall employ a chemist in their factory to analyze their clays and test their product. In some branches of clay-working this indeed is a perfectly feasible and rational suggestion. But the number of such cases is very small. What most factories need is not a chemist to work every day in his laboratory, but a manager or superintendent who has had the benefit of a chemical course, and who understands the subject whether he has the practical skill to make analyses or not. Many men who are by nature kindly disposed towards the use of improved means in their business have considered this subject, and after looking the matter through they could see no gain in proportion to the monthly salary of even a young chemist. No wonder they thought that way. In most brick works and sewer-pipe factories a chemist, to do nothing else but make analyses, is no more required than a skilled electrician would be to take care of a dozen or so of electric lights. In other words, it is not a multiplicity of analyses that is wanted: it is management by a man who knows what analysis means and how to use it.

And this ought not to be at all out of the reach of even small clay works, for if brickmakers show a desire to put men of this class forward into their positions of trust, like burners, foremen, and superintendents, there is no doubt that there will be plenty of bright young fellows glad to qualify themselves for this work.

A second reason is found in the fact that so far no American college has yet offered a course in ceramics or has even announced that they are prepared to give special instructions in that branch of chemistry which deals with the problems of clay-working.

Now, chemistry is a very broad science: it is much too large a field for any one man to cover, even if he devotes his life to the study. But the general laws of chemistry, and the framework or skeleton in which all the vast array of detail hangs, are by no means so complicated but that any good mind can master and use them. The application of these laws and principles to any one kind of technological business is in itself a full field of study for any man to undertake. A chemist cannot master the technical chemistry of iron-making without much time and patient labor. Paper-making, glass-making, clay-working, fertilizer manufacture, cement-making, and in fact dozens of special branches, each require the use of a different set of facts, though all hang directly to the great and important framework before described.

Now, the technical chemistry of clays is not especially difficult or complex, unless it be made to include composition and use of glazes, enamels, and other compounds where the variety of chemical elements used to produce the different colors is very large. But while in general the chemistry of ceramics is not exceptionally difficult, nevertheless it is quite distinct and separate from any other kind of chemical work, and thus it happens that no college course supplies just exactly what a skilled clay-worker ought to know.

The degree of Engineer of Mines as taught in most of the standard schools of the country is much more nearly in line with the requirements of clay-working than any other course. But it fits a man equally well for the position of blast-furnace superintendent or gold miner; so it is easily seen that, though a graduate in this course knows the principles on which clay-working rests, still he has to learn all the details which make his knowledge useful and practical after he leaves school.

Also, to take the course of Engineer of Mines requires that the student shall be fairly well advanced before beginning it, and that he shall spend four years in taking his degree.

This in itself is necessary, because to fit a man to even enter so wide a range of professions as belongs to this course requires the pursuit of many studies and the use of much time. But to master the scientific work especially needed in ceramics alone need not be so long a matter.

The studies which are especially useful in this course are geology, mineralogy, chemistry, metallurgy, civil engineering, mechanics, and perhaps electricity.

Geology, especially in its economic aspect, is useful in defining the origin of clays, both as to the mineral itself and as to its location. We learn what the influences were which brought the clays into the deposits where we find them, and how to look for clays, how to trace and identify them.

Mineralogy instructs us on the composition of clay as a mineral. It shows us that pure clay is a very rare mineral, and that what we call clay is a mixture of a number of minerals.

It explains how the proportions of these minerals vary in different clays, and how some of them are called impurities on account of their effect on the nature of the clay.

Chemistry has already been described as the mainspring of all our knowledge regarding ceramics. Metallurgy is the application of chemistry to the problems of extracting the metals from their ores, but it incidentally brings in much that is of prime importance in ceramics.

The formation of silicates by heat, their fusion and thermal properties, the nature of fluxes and refractories, the nature and combustion of fuel, the construction of furnaces, kilns, and apparatus for generating heat, and many other subjects, are considered, which any one can see are directly useful to the work of clay-burning.

The engineering sciences, civil and mechanical, both contribute much that is useful to the clay-workers, but is knowledge which is connected with the construction of factories and the manufacturing operations, and the use of the materials made, rather than in considering the nature of the material itself. Civil engineering is the great art of construction, in supplying the demands of which most of our factories find their work. Naturally, knowledge of this study must be useful not only in the factory, but in keeping the products constantly abreast of modern improvements and the increasing demands of engineers and architects.

And certainly no practical clay-worker would consider an education complete without some instruction on the topic of mechanics, — the use of steam, the generation of power, how to convey and apply it.

Also the design, construction, and repair of machinery is a subject which he will learn by bitter experience in the shop, if he does not at school; for what clay-worker is there who has not put in many a night and Sunday in patching up his machinery for another trial?

Electricity has so far been of very limited use to the clay-worker. As a means of generating power, its development is proceeding so rapidly that none of us can tell to what extent it may be used in our time in our factories, and for this reason its principles ought to receive some notice in a technical course.

The use of manual training as an adjunct to technical education has been lately introduced in some schools. No one can dispute its value, especially to a student who has never had any experience in the practical part of the study he is pursuing. It enables a man to judge of the work, both in quantity and quality, which others are doing for him, and makes him quick to detect laziness and negligence in his employees simply by the light of personal experience. This is unquestionably valuable, and wellnigh indispensable to any man who has to handle the labor of others.

In a full ceramic course extending over a period of four years, manual training should be incorporated.

Some of the previous writers on this topic have contended that a clay-workers' school should be largely practical, and that it should contain machinery of all common types, — dryers and kilns, and everything

that clay-workers use, — so that the scholar learn by experience the practical knowledge of the shop. In my judgment this plan is neither wise nor feasible. Men go to school to learn principles, not to learn the minute details of their life-work. No school of any kind pretends to turn out men competent to step at once to the front rank of practical technical work.

The idea and principle of education is to train the intellect so as to enable it to judge in later life of the correctness or fallacy of whatever comes before it. The best plan to learn practical clay-working is right in the brickyard or pottery.

So much as to the studies of a ceramic course.

As I have said before, no American college gives anything in this line.

While distributing some of the literature of the Ohio Geological Survey recently, I received a request for a volume for the professor of ceramics in the Imperial University of Japan, who is now in Berlin on leave of absence, perfecting himself in all that modern German chemistry and technology can add to his already rich store of information. It seemed to me a great reproach to this country that little Japan should teach branches of science which Americans have to go to Europe to study.

There are two things needed in connection with this subject. One is a formal ceramic course attached to some university able financially and scientifically to make it equal to that of any foreign school. This is no light matter; it cannot be done in a day, nor can it assume its place at the head of the American clay-working fraternity except by a process of growth.

The second thing needed is one which is easier to get, and more directly and plainly valuable to the practical clay-workers of the country. This is a short ceramic course, designed to take as pupils the able and clear-minded young fellows whom we have employed in our factories as burners, firemen, and high-grade workers, and give them in a two years' course all that can be condensed into that period of the sciences which I have before mentioned. These young men, the pick and flower of the clay-workers, would come to college full of the practical knowledge of the brickyard and pottery. They would have a good many erroneous ideas to knock out, and a good many prejudices to overcome, but, in two years' time devoted closely to the study of what they need most to know, they would go back to their work with new and enlarged ideas of its dignity and possibilities.

Surely there is nothing impracticable or visionary about such a scheme.

In Ohio we have a short mining course, devoted to the education of practical miners, who come to the school at the age of thirty or thirty-five years frequently, and who have been prevented from rising in their work simply from lack of the very technical education they are thus enabled to get; also, we have a short agricultural course, in which the young farmers can get in two years the heart and core of what the full and formal degree would give them.

There has never been a more beneficent application of the educational machinery of the State than in these short technical courses. It is the simplest and most successful way to raise the standard of technical industry, and if the plan has been tried successfully on miners and farmers, why should it not succeed on clay-workers? The importance of the industry certainly demands it, and the utter lack of such training in any regular course makes it still more urgent that a short practical course should be prepared. What can the N. B. M. A. do toward furthering this cause?

It is not for me, a new member, who is attending his first convention, and who is not yet familiar with the objects and aims and possibilities of this Association, to suggest any radical steps, even on a line so directly important for the good of the industry as this kind of education undoubtedly is. But there are others here who will be able to formulate some steps to put us on record as conscious of our need, and our willingness to assist the cause forward.

EDWARD ORTON, JR.

Columbus, O.

BRICK AND MARBLE IN THE MIDDLE AGES.

(Continued.)

CHAPTER II.

"For pallid Autumn once again
Hath swell'd each torrent of the hill;
Her clouds col'ect, her shadows sail,
And watery winds that sweep the vale
Grow loud and louder still."

— *Campbell.*

AT Basel we engaged a *voiturier* to take us to Baden, whence the old Swiss railway was to have the privilege of conveying us to Zurich. Our scheme for reaching Italy was to pass by the lakes of Zurich and Wallenstadt, and then, following the valley of the Rhine, to cross over the pass of the Splügen to Chiavenna, and so to reach Lake Como.

We left Basel at two o'clock in the afternoon, hoping to reach Baden by about nine; the weather looked threatening, but we took a cheerful view of this, as of everything else, as all good travellers should, and comforted ourselves with the thought that at any rate we could better afford to have a wet day between Basel and Baden than between Zurich and the Splügen.

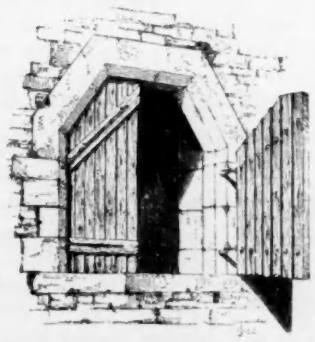
The view of the city as you leave it is certainly very striking; the cathedral spires are picturesque in their outline, and the number of churches with turrets and steep roofs combine with them to produce a most ecclesiastical-looking town. Nor need any one interested in architecture despair of finding much pleasure in a more careful inspection of its buildings. They are full of interest, though generally passed too rapidly by people in a hurry to get on to enjoy the pleasures which await them beyond.

The roofing of the cathedral is worthy of notice as being composed of variously colored tiles, arranged in diamond patterns over the surface of the roof, and giving a degree of richness to the coloring of this generally heavy part of the building which is very admirable.

In another fine church of the early part of the fourteenth century here, I remember being amused to see how quietly the storks possess themselves of all kinds of places for their nests, and think even the ridge of the steep roof of a church a proper place for their abode. The good people at Basel build their chimneys with flat tops for the express benefit of their long-legged friends, who, from their elevated and well-warmed abodes, look down sedately, and with a well-satisfied air upon their unfledged brethren below.

Why the people here love storks, the people of Venice pigeons, and the people of Berne bears, I leave to more industrious inquirers to decide, satisfied only to notice the fact that it is so, as each of these fancies adds one to the list of local peculiarities so valuable in the recollections of a journey.

The road from Basel to Baden is for the first half of the way very pretty; we came in, unfortunately, for rather drenching rain, and so lost all beyond the suggestion of some striking views. The towns through which we passed were not of much interest, though there were many picturesque and pleasant-looking subjects for the pencil. The most striking place on the road was Rheinfelden, a largish village (or perhaps I ought to say small town, as it rejoices in a Rath-haus of some pretension), surrounded by very high walls, and entered by tall stone gate-towers, pierced with pointed arches, and surmounted by upper stages of timber, with tiled roofs of quaint and effective character; and here and at Stein and Baden I noticed that almost all the houses were old and very little altered. I observed particularly the old shop windows of very simple design, closed with folding shutters, and taking one back to old times most decidedly in their design.



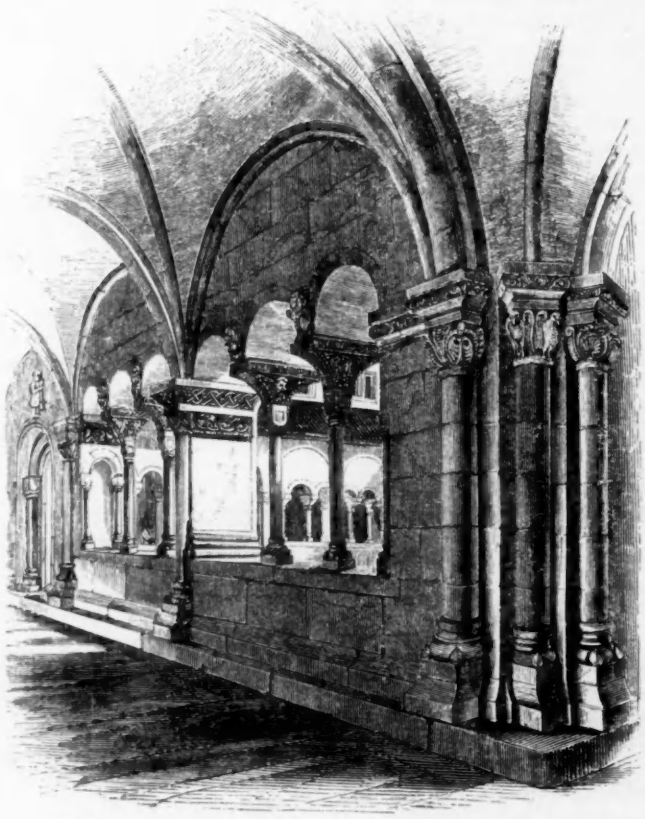
SHOP WINDOW, RHEINFELDEN.

Beyond Rheinfelden the road, which so far has skirted the Rhine rather closely, leaves it again for a few miles until it touches it for the last time at the small town of Stein.

From Stein we saw an imposing-looking church on the other side of the river at Sekingen. It has a great western front with two bulbous-topped steeples, and is of very considerable length. The division between choir and nave is marked by a delicate turret, and the whole church, as far as one can judge by a distant view, looks as though it would well repay a visit. There are six bays in the nave, five and an apse in the choir. The former has very simple windows, whilst in the latter they are rather elaborate. There is no aisle to the choir and no transept.

The rain continued incessantly until we reached the long, straggling village of Frick, a quaint and antique-looking place, where our *voiturier* stopped for an hour to bait his horses, who, however, at Rheinfelden had enjoyed a treat in the shape of a loaf of very brown bread, a kind of food second only, in the estimation of foreign steeds, to the precious *morceaux* of lump sugar with which Swiss *voituriers* are so fond of encouraging and petting them.

We were nothing loth to stretch our legs: and, finding that the church was worthless, — one of those unhappy, bulbous-roofed erections so common in some parts of the Continent, and the roof of even the eastern apse of which was twisted into a most ingenious and ugly compound curve, — we took up our quarters in the respectable hostelry and "Bierbrauerei" of the Angel, and devoted ourselves to the consumption of coffee and beer of no bad quality. Our host wished sadly to see us located under his roof for the night, but we were resolute in our determination to reach Baden that night, and so persisted in going, though to our subsequent regret.



CLOISTER, ZURICH CATHEDRAL.

It was soon dark, and the new moon, which shone cheerfully upon us, gave us just a glimpse occasionally of the scenery, which about Brugg, where we crossed the Aar, and again at Königsfelden, seemed to be remarkably good.

At last, at about half past ten o'clock, we reached what we fondly hoped was to be our resting-place. But Baden chose not to take us in, and to our horror, as we drove up to the chief and only available inn, we were met with the dismal announcement from the mouth of the civil landlord, that all the rooms were full.

However, we dismounted, and found that there was no other inn in Baden proper, but that at the Baths there were several; at them our landlord assured us that he knew we should find no room, and so we thought it useless to return and try. Our only course seemed to be to feed our horses again and then go on to Zurich; and as Swiss drivers and Swiss horses never seem to tire of trotting on slowly and drowsily along the road, there was no difficulty in at once coming to an arrangement with our coachman.

Accordingly, at midnight we started again, hoping at some early hour in the morning to reach Zurich. It was sufficiently provoking to be toiling on slowly and sleepily for nearly four hours almost alongside of a railroad which would have taken us early the next morning in three quarters of an hour; but there was no help for it, and so we did the best we could, by sleeping whenever we were able, to pass the weary hours away.

At last, just as the day began to dawn, we came in sight of Zurich and its lake, and last, not least, we reached the great hotel. Here we pulled up, knocked desperately, awoke the slumbering porter — but, alas! only to hear again the unwelcome sounds which had greeted our ears at Baden! He suggested, however, that at the Hôtel Belle Vue we should probably find beds, and so on we drove, rather in despair at our prospects, though, happily, unnecessarily so, for the Belle Vue gladly opened its arms for our reception, and ere long we were, oblivious of all our toil, comfortably ensconced in bed. From our windows we had a pleasant view of our quarters; it was broad daylight, and the prospect was — as from such a position, looking up a lake, it always is — very fair and charming.

We were up again soon after eight, and were glad to find the morning fine, though the clouds were low, and we saw, consequently, nothing of the distant view of mountains which lends its greatest charms to Zurich. The town is, however, pretty and striking. The picturesque houses, with wooded hills on all sides beyond them, and very charming views of the lake, if they do not make its attractions first-rate, at any rate make them very considerable.

The main feature of interest for me was the cathedral, a fine Romanesque church, very fairly perfect, but mutilated in its interior arrangements by the Calvinists, in whose hands it now is. In plan, it has a nave with aisles of six bays, a short choir, and east of this a square-ended sanctuary, the aisles having apses, roofed with semi-domes. In the nave two of the aisle-arches make one groining bay. The transverse groining-ribs are of a simple square section, the diagonal ribs having in addition a large round member. The triforium

is very large and fine, and is made use of for congregational purposes, being fitted up with seats, which, curiously enough, are all made to turn up as misereres. There are no transepts. The sanctuary arch is loftier than the choir arch, and seems to have been intended to be very distinctly marked. In the clerestory there are two simple round-headed lights in each bay; the choir is arcaded all round internally, and for frigidity of effect cannot be surpassed; the internal fittings comprise an immense pulpit, but, so far as I could see, not even an apology for an altar.

The exterior has two western steeples, and a north doorway, each jamb of which has three detached shafts, standing considerably in advance of the wall, which is entirely covered with diapers. The arch itself is semicircular, and very simple in its moulding: but this simplicity rather adds to than detracts from its general grandeur of effect. The whole is inserted in an additional thickness of wall, set on, as it were, against the original wall; and the extreme width of the doorway itself is no less than eighteen feet nine inches. The cloisters were remarkable, and very good of their kind: the arches rested on detached shafts, the capitals of which were elaborately carved in a very peculiar manner, but very effectively. The whole design was unlike any Northern Romanesque, and bore much more similarity to the best Lombard work. Unfortunately, the whole of this cloister was rebuilt in 1851, the carving having been re-worked or renewed throughout in imitation of the original. It will be seen, however, that, in spite of alterations, this is a very fine church, of a very early type, and peculiarly valuable in a country which, like Switzerland, has comparatively little left that is really good in the way of architectural examples.

There are other churches in Zurich, but I believe not old, and at any rate I had no time to examine them. One of them is appropriated to the use of the Roman Catholics; and there is one desecrated, rising from the edge of the lake, aud forming a prominent object in the general view of the town as you leave by the steamer; this is of good outline, but has no details remaining of any value. The point chiefly to be noticed in the churches of Zurich appears to be the way in which their spires are all painted red, looking in the full sunshine very bright and picturesque.

The Swiss have a great feeling for bright color, and on our way from Basel to Baden we noticed one of the many instances of this in several turrets covered with brightly colored glazed tiles. A light green seems to be the favorite color, and is commonly used without mixture with any other. They look best with their lower side rounded, and when of small size; and are constantly used in turrets rising out of roofs which are entirely covered with plain tiles. I remember, two years before, noticing with extreme pleasure the beauty of some dark-green tiles used at Schaffhausen; and I have already had occasion to mention those on the cathedral at Basel with equal commendation. Unhappily, we have to lament that English people, in their insane hatred of bright colors, if they saw such tiles used in England, would be horrified at such a violation of the correct simplicity and uniformity of color to which the cheapness of slate has made them accustomed. Some modern attempts, however, at introducing colored tiles have not been so successful as could be wished; and of all, perhaps the least so is the roof of the new Maria Hilf Church at Munich, on which tiles of light-blue color are used in such large masses that at first sight it seems that half the roof is stripped, and that the pale-blue sky is seen instead of roof.

At ten o'clock we left our hotel by the steamer for Schmerikon at the head of the lake of Zurich. The weather still looked doubtful, though much better than on the previous day, and our host of the Belle Vue, taking a good view of this, as is a landlord's duty, conducted us to the boat with smiling anticipations of fine days to come.

The shores of the lake are, for the greater part of its length, literally fringed with houses all painted white, and contrasting violently with the trees, vineyards, and green hills by which they are backed. On the north, the shore is low and gradually shelving down to the water; on the south it is rather more precipitous, but after all not very striking. At the head of the lake heavy, dark, round clouds hung upon the hills, and left us in pleasant doubt as to whether or no we had fine mountains to discover when they cleared away; a doubt, as it happened, not settled as far as we were concerned, save by certain lively and not too trustworthy representations which we afterwards met with, in the shape of advertisements of the Zurich hotels, and which showed a line of snow mountains as the ordinary horizon of their visitors.

The churches on the lake are very numerous and very similar. The steeples are almost always gabled, and from these gables rise spires painted red, and very thin and taper in their form. The gabled sides of the towers are generally made useful rather than ornamental by the introduction of enormous clock dials. The only decidedly mediæval church which I saw between Zurich and Rapperswyl was at one of the villages on the north shore of the lake, I think at Meilen, but I am rather uncertain as to the name. Its design is both novel and very good; the pinnacles on the gable being unusual in saddle-backed steeples, and giving considerable picturesqueness of outline. The accompanying woodcut will show the general character of the design, and it will be seen that the tower is on the north side of the choir. The steeple roof is covered with grayish-red tiles, with a pattern marked on them with yellow tiles.

CHURCH ON THE LAKE OF ZURICH.

The steamers on this, as on most Swiss lakes, are somewhat tedious in their journeys, as they take a most zig-zag course, first calling on one side of the lake and then on the other, until one doubts whether one will ever reach the journey's end. At Horgen, of course, we discharged a large proportion of our English passengers, who were all bound for the Rigi, but their places were soon occupied by the umbrella-loving natives, who flocked in and out of the boat in great numbers at every station, and by the time we reach Rapperswyl we had no more fellow-countrymen in the boat, and, perhaps, like many Englishmen, to say the truth, we then first thoroughly realized that we were abroad. Much as one loves one's country, certainly one source of pleasure when abroad is the not hearing too much English spoken, or seeing too many English faces.

At Rapperswyl, famous for having the longest bridge in the world, there is a most conspicuous group of buildings on rising ground above the lake, very picturesquely thrown together; it consists of a church and a castle; the latter has several towers capped with pyramidal and saddle-backed roofs, and the former has two towers in the position of transepts, with saddle-back roofs gabled north and south, the southern tower being considerably the larger of the two. Altogether, the group is one of uncommon variety and picturesqueness of outline. Below, in the town, is a small church, with a most happily conceived, though very simple bell-turret rising out of the roof, square in its plan, but capped with an octagonal spirelet. This is a not uncommon plan in this part of Switzerland, and is always most agreeable in its effect. The views from the terrace by the side of this castle are of singular beauty. It is high enough above the lake to command a good view of its whole expanse, and to secure a not too distant view of some of the mountain peaks of Glarus. Rapperswyl is a good point to stop at, for the sake of a visit to the famous pilgrimage church at Einsiedeln, certainly one of the spots in Switzerland most curious and

interesting, though its building have no claims to our regard on the score of architectural beauty.

Passing under, or, rather, through the bridge, we found that it was very narrow and had no side railing of any kind, so that it appears to be far from a pleasant contrivance for crossing the mile or two of shallow water which here scarce serves to keep up the appearance even of a lake; and perhaps it is upon the score of the absence of real dangers of drowning if one fell over that they dispense with any protection. At Schmerikon, which we reached in four hours from Zurich, we left our steamer, and immediately embarked on a barge, in order to go by the Linth canal to Wesen; but we found that, however expeditious this might be in descending, it was a kind of conveyance not to be recommended highly to any one wishing to ascend the canal, inasmuch as — unlike ordinary canals — this is neither more nor less than the glacier torrent of the Linth, bringing down the melting snow from the Glärnitsch and Todi glaciers, and rushing along at a really tremendous pace. To those, however, who have time, it may be commended as affording magnificent views of the mountains of Glarus, and of those which rise so grandly above the Lake of Wallenstadt.

As we entered the canal from the lake we were amused by the unsuccessful attempts of our crew to secure some wild fowl, two of which they succeeded in shooting, and then, without any kind of regard for the feelings of passengers panting to arrive at Wesen in the promised two hours and a half, they deliberately proceeded — of course in vain — to chase the unhappy birds, which, though wounded, were quite able to dive much deeper than their enemies could reach, and so the only consequence of the chase was a hearty laugh at the expense of the baffled sportsmen, half an hour's delay, and much lost ground to be made up.

The entrance to the canal was very striking; a low hill covered with larch and birch rose from the water's edge, and above this, the mountains, gradually shelving upwards, were terminated in a line of rocky ridges of very grand and rugged character. Whilst we were admiring the view a slight shower passed over us, and the sun, suddenly breaking out, produced one of those lovely effects of color so peculiar to mountain scenery; a rainbow seemed exactly to fill up one of the great basins formed by the undulations of the mountains, and, after bathing a great sweep of mountain side in the richest and most distinctly marked colors, gradually died away.

The canal, which at first looks more like a river, soon takes a bend to the southwest, and then, passing under a quaint wooden bridge, over which passes the road to Uznach, we found ourselves in what certainly looked sufficiently canal-like. The stream is so rapid that the walls built up on either side are preserved from being washed away by stone groins running out into the stream and acting as so many breakwaters to keep the water in the centre. Slowly and steadily our horses pulled us up, whilst we, mounted on the top of the cabin, were able to see over the walled sides of the canal and to enjoy the glorious prospect before us.

Before long our captain blandly informed us that he was going to stop for dinner at a wayside house, so we, anxious to make the same good use of our time, attempted to follow his example. Unfortunately the landlord, though very jolly-looking, had a very badly stocked larder, and we had to satisfy ourselves with bread, honey, and wine. It is true, indeed, that our host did produce same cold meat, — portion, as I imagined, of a goat dressed some ten days back, — but this was not eatable, and was valuable only as furnishing an opportunity to him of showing his perfect power of making the best of a bad thing. To season the goat he brought in vinegar and oil, and, putting them upon the table, exclaimed with some *empressement*, "*Voilà, monsieur; mais la vinaigre n'est pas bon!*" just as if this was the strongest recommendation he could give us! We laughed heartily, avoided the vinegar, and parted good friends with our host, thanking him from our hearts for having saved us the painful operation of making the discovery about its quality for ourselves!

Our not very satisfying repast finished, we embarked again upon our barge, and in the occasional intervals, when sudden and heavy storms of rain obliged us to seek shelter in the cabin, we were much amused in watching the proceedings of some men belonging to the boat, who spent the whole of the five hours consumed in the journey in an unceasing game of cards; I must do them the justice to say that they played very good-humoredly, and laughed without ceasing. Under no circumstances could we have seen the scenery more gloriously; occasional bright gleams of sunshine broke in upon and followed clouds of the most inky hue, and then came pelting down heavy showers, accompanied by howling wind, and darkness; and as we reached the opening of the valley, looking up beyond Glarus to the great mountains which close in its upper end, I think the effect was really more grand and terrific than anything I have ever seen. The mountains are of very fine outline, and of great height, as we saw by the more than occasional glimpses which we had of snow about their summits. By the time we reached Wesen the wind was so violent that we found it difficult to keep our places upon the top of the cabin; and we disembarked just before the dark, in time to see the fine mountains on each side of the Lake of Wallenstadt here and there through the storm clouds, and its waters beaten by the wind into not insignificant waves. We had to walk through the entire length of the village — picturesque, quaint little place, sheltered under the almost overhanging rocks at the side of the water — and arrived at last at the capital and thoroughly Swiss inn, the Hôtel de l'Epée, where we were to sleep.

Travellers now speed very differently along this country, and, I fear, see less than they ought of its beauties. Steamboats no longer attempt to pass beyond Rapperswyl, and the railway hurries one along by the beautiful Lake of Wallenstadt to the valley of the Rhine, only earning one's gratitude when one is in violent haste, and because by a branch line it makes a detour to Glarus and Stachelberg much more possible than it was when first I made the journey. On the whole, I ear, where railways pass through beautiful scenery, the tourist loses more than he can possibly gain, not only in the views of the country, but equally in the incidents of travel, which are becoming only too monotonous and similar everywhere.

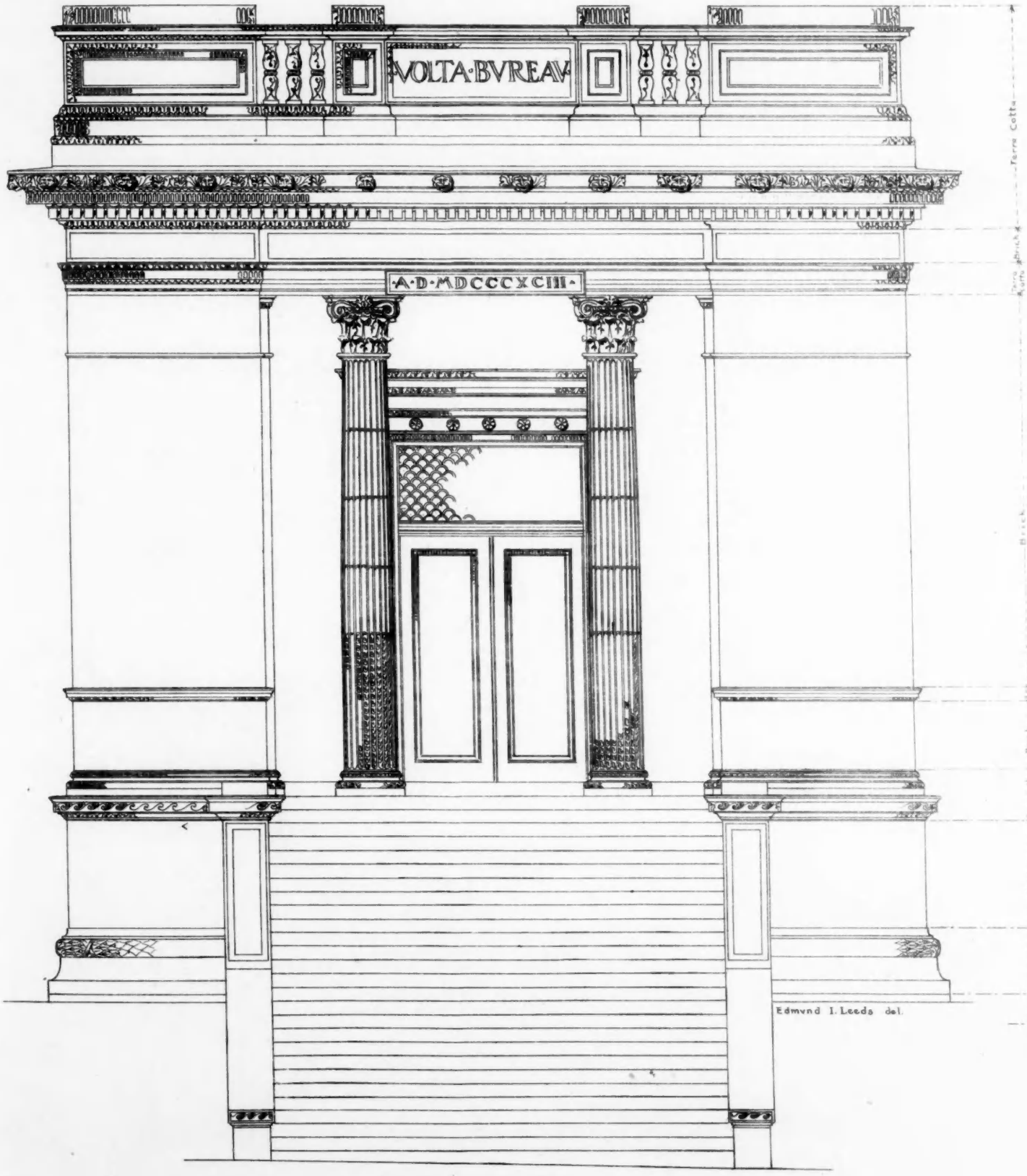
(*To be continued.*)

DETAIL OF WINDOW HEADS, VOLTA BUREAU, WASHINGTON, D. C.
PEABODY & STEARNS, ARCHITECTS. PERTH AMBOY TERRA-COTTA CO., MAKERS.

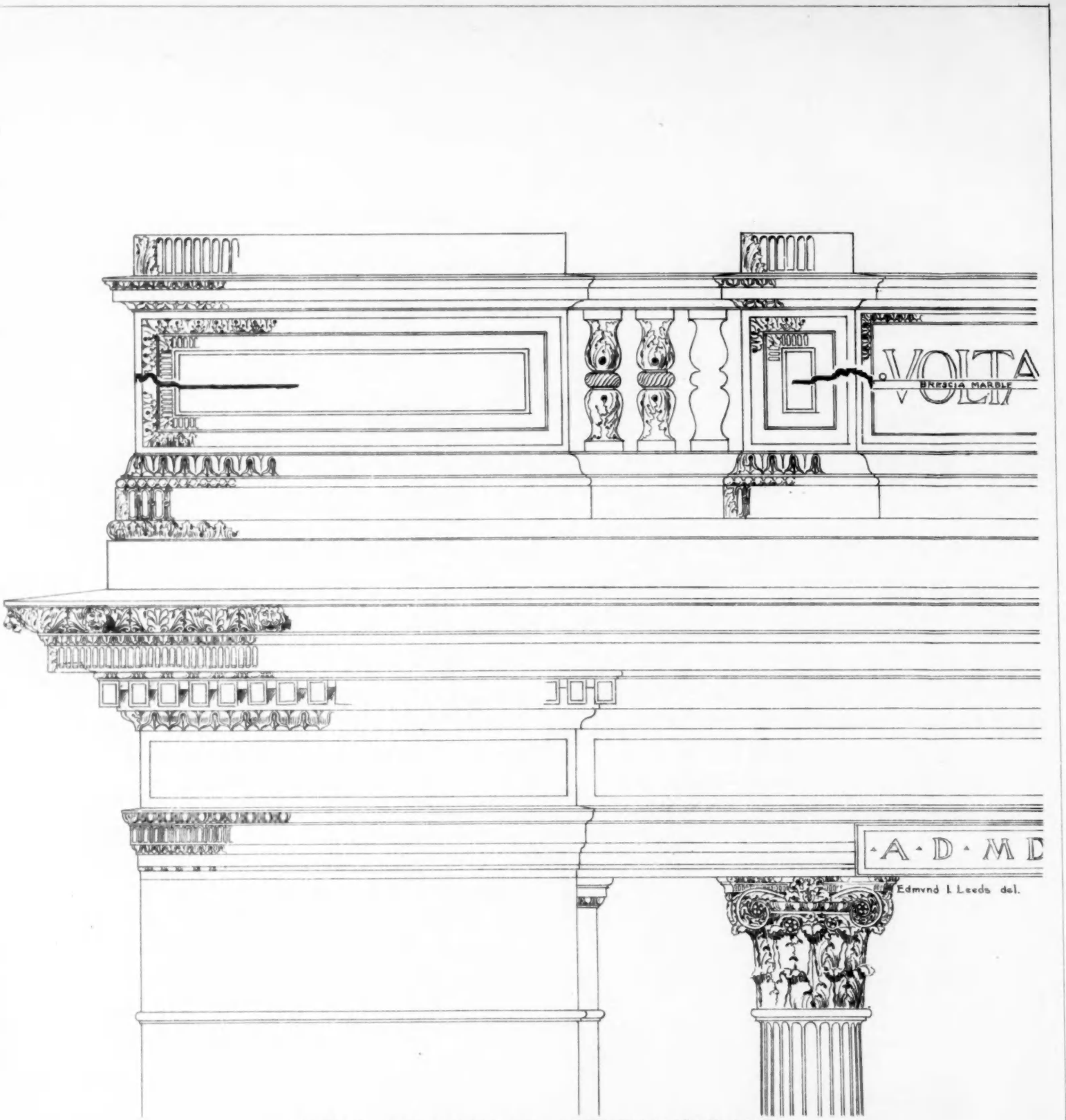
▪ VOLTA ▪ BVREAV ▪

WASHINGTON D.C.

PEABODY AND STEARNS ARCHITECTS.



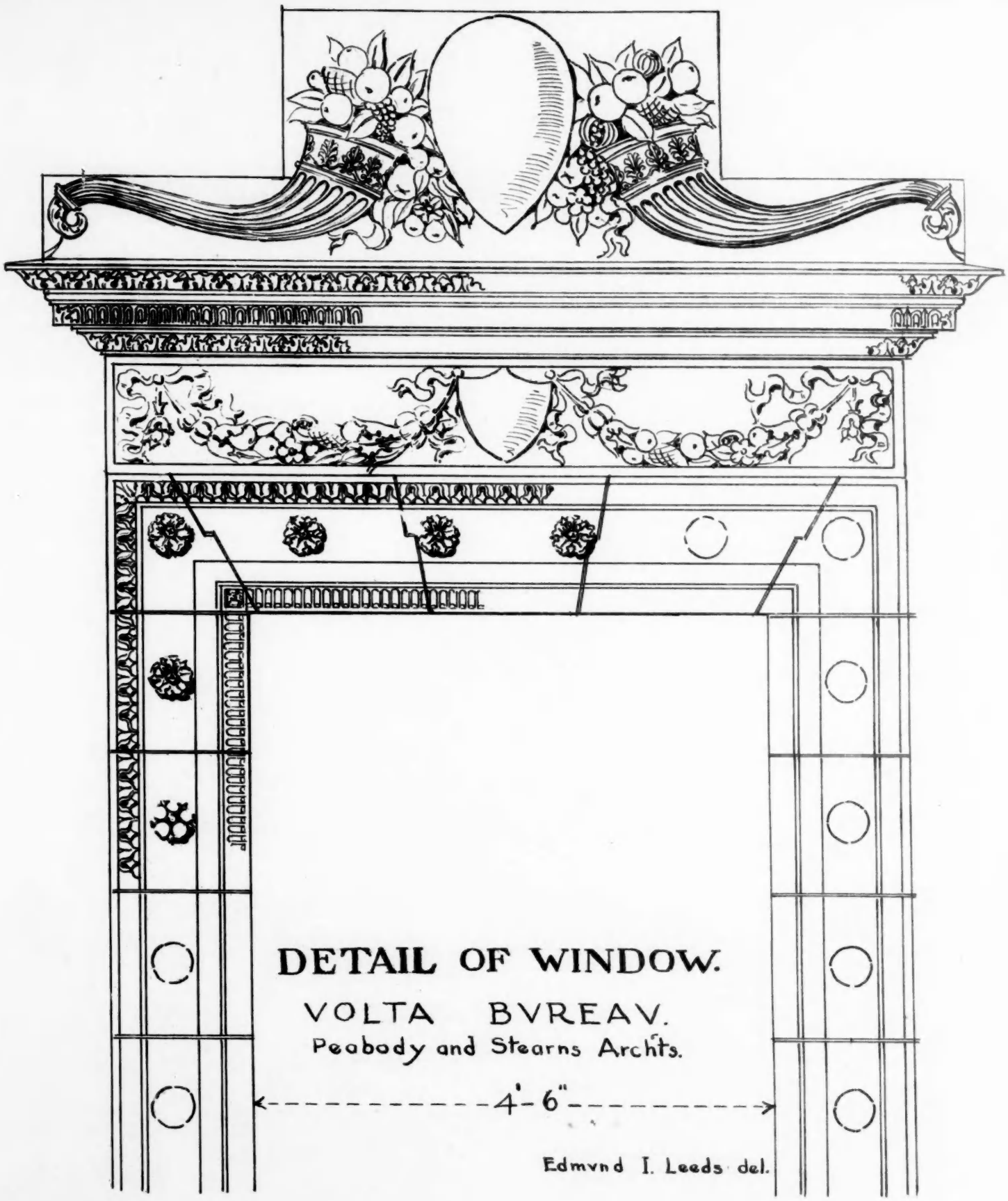
▪ FRONT ▪ ELEVATION ▪



DETAIL OF CORNICE AND BALVSTRADE.

VOLTA BVREAV WASHINGTON D. C.

Peabody and Stearns Architects.



DETAIL OF WINDOW.

VOLTA BVREAV.

Peabody and Stearns Archts.

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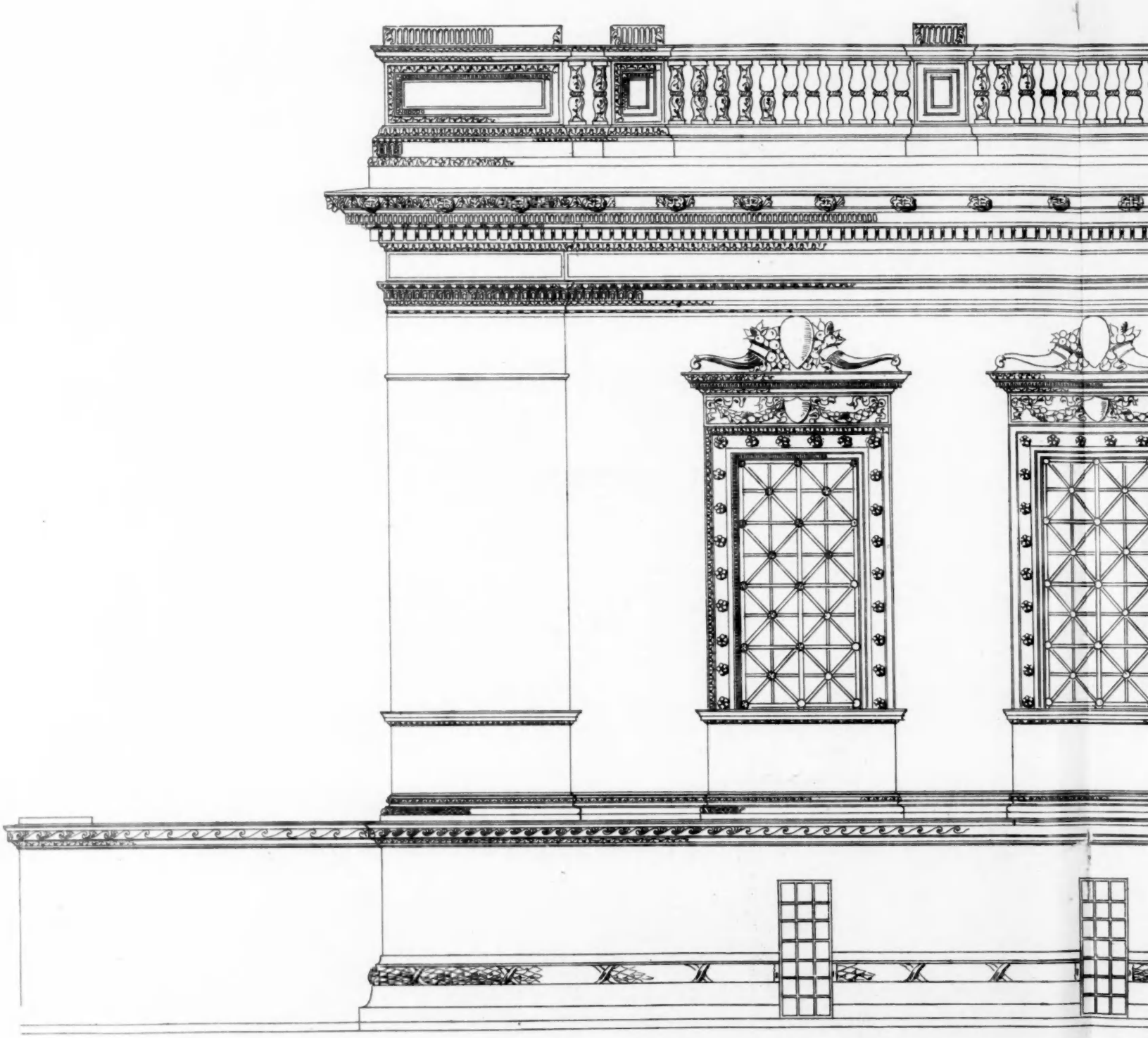

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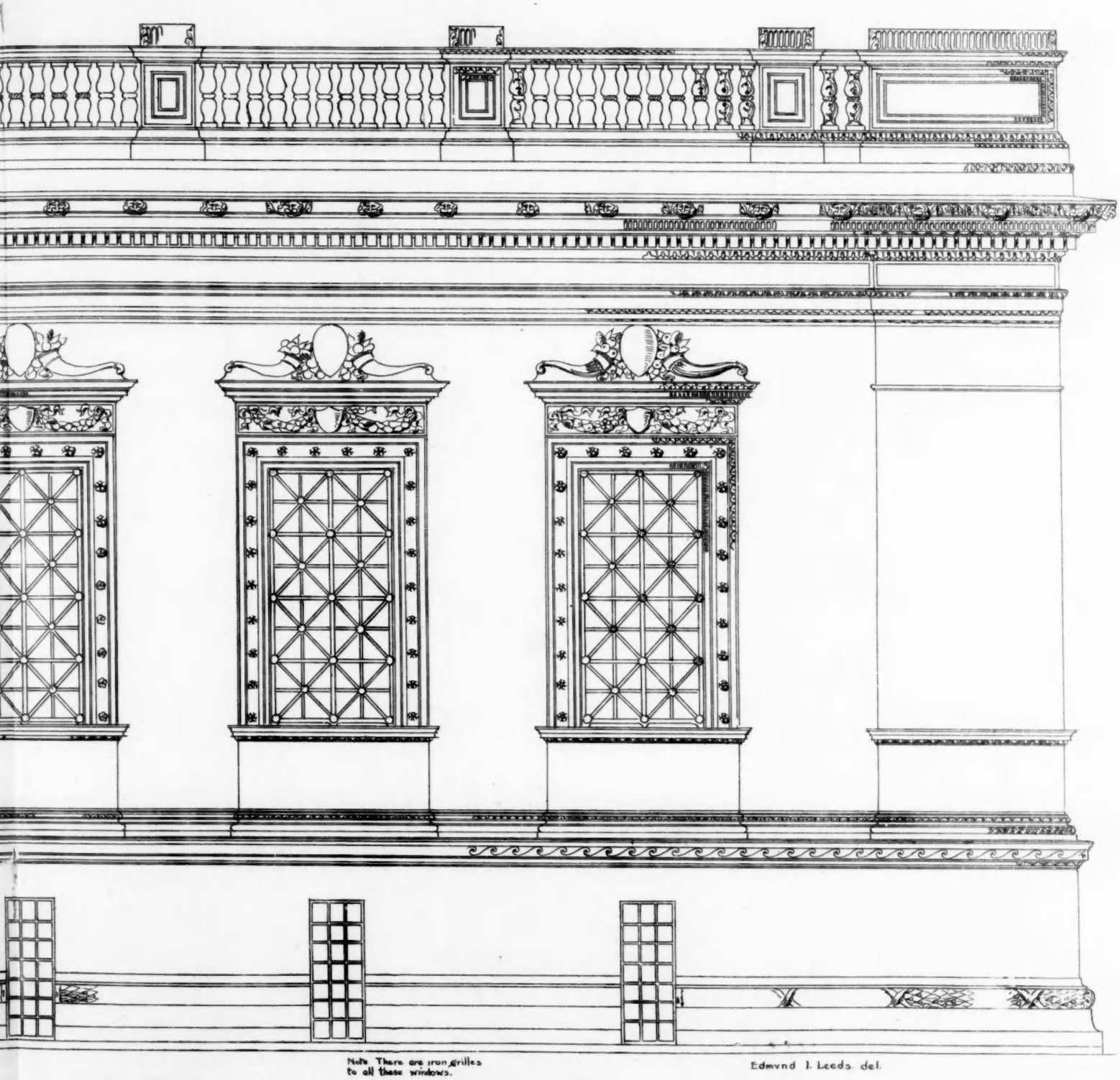
VOLTA · BVREAV ·

WASHINGTON D.C.

PEABODY AND STEARNS ARCHITECTS



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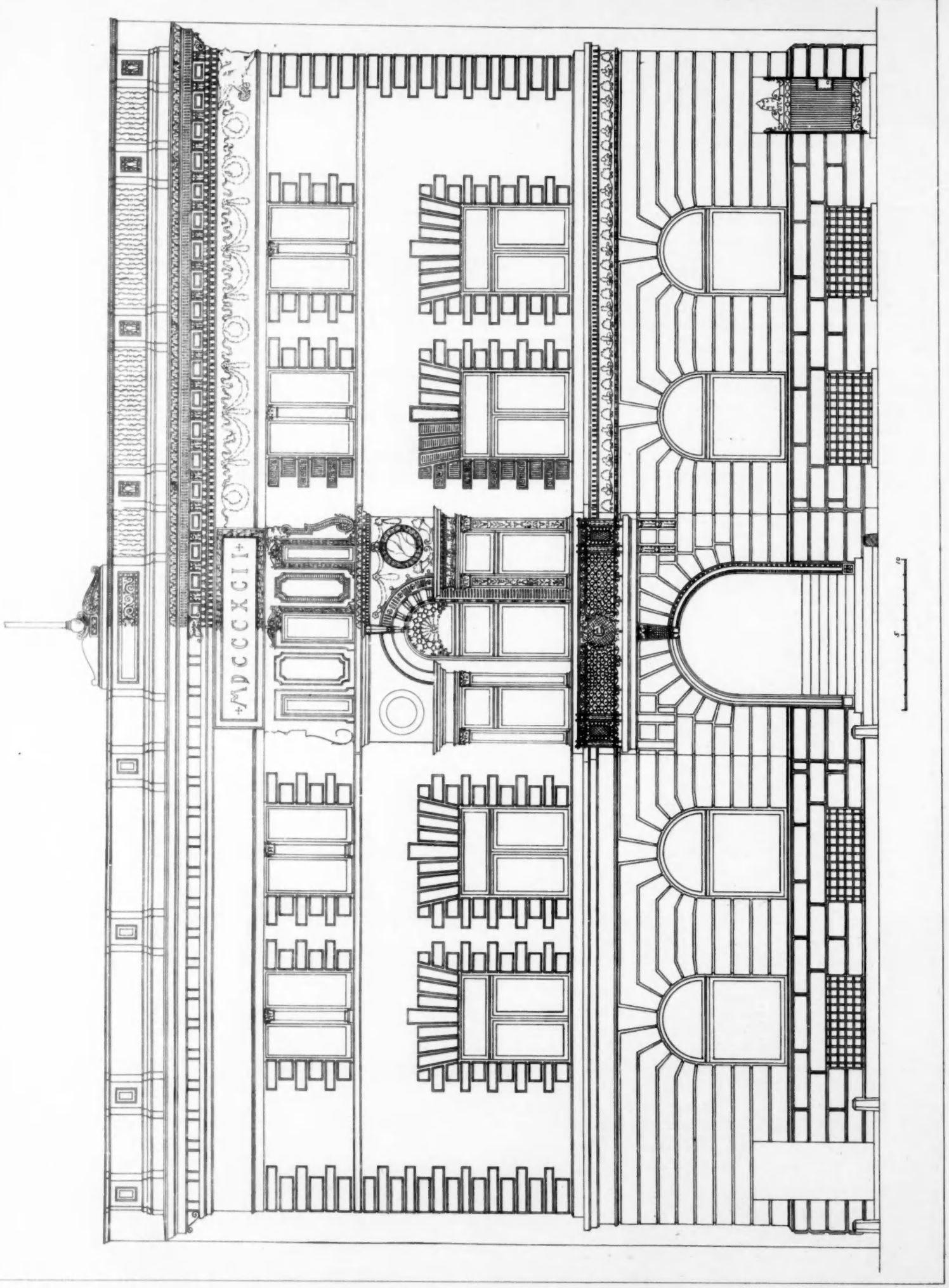
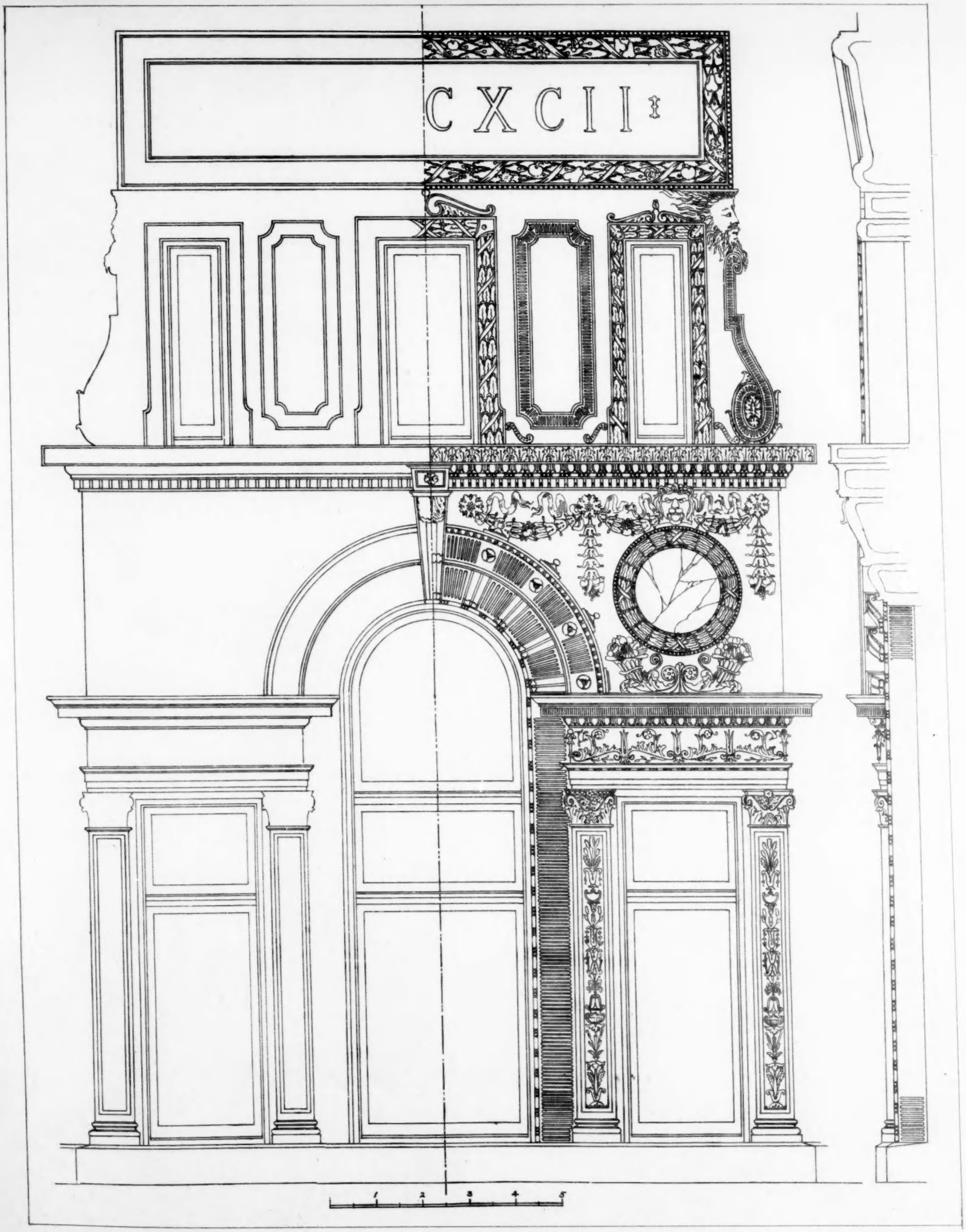
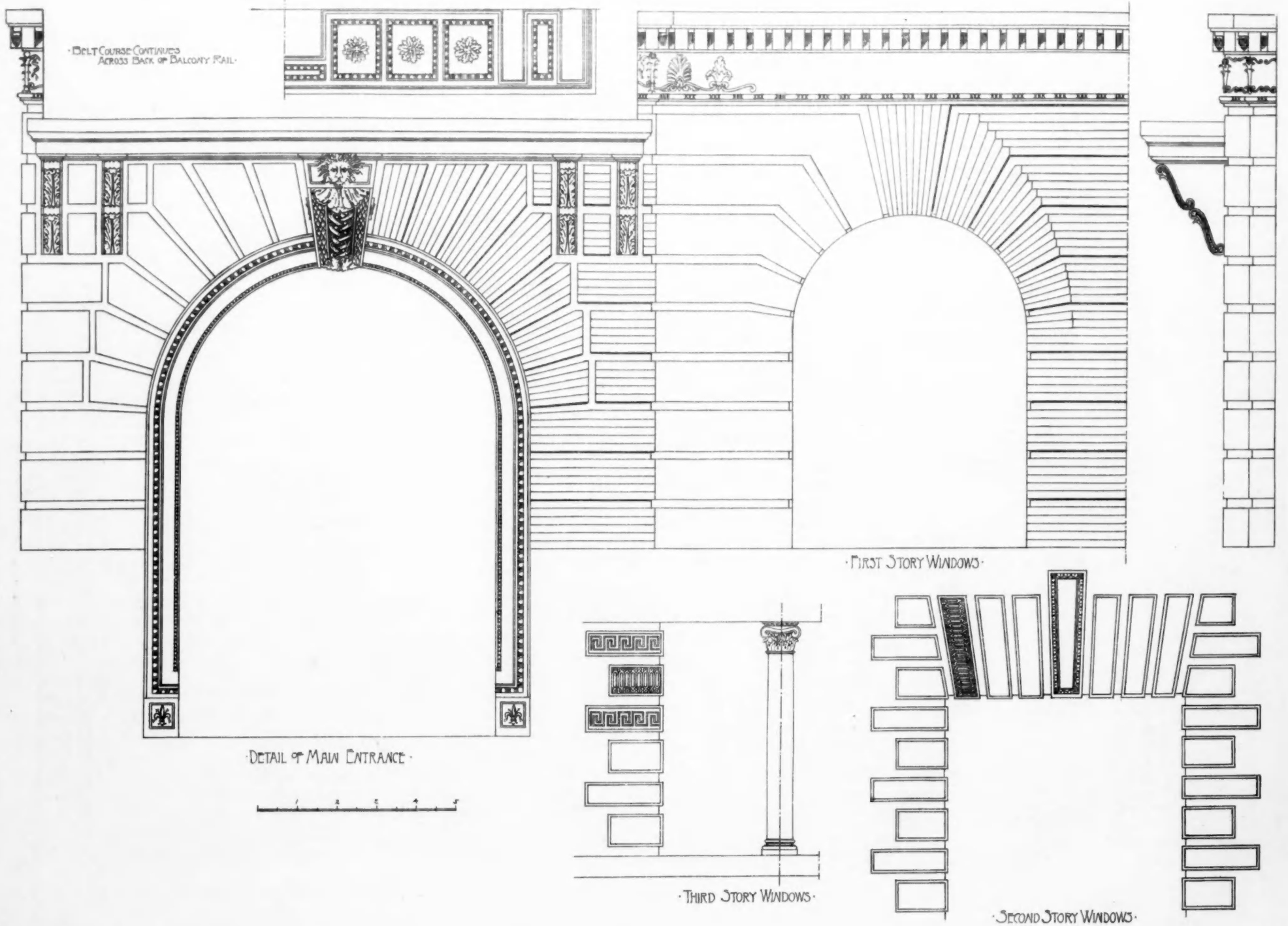


DETAIL OF CENTRE PORTION OF EUREKA CLUB BUILDING, ROCHESTER, N. Y.
NOLAN, NOLAN & STERN, ARCHITECTS, ROCHESTER.



FRONT ELEVATION OF EUREKA CLUB BUILDING, ROCHESTER, N. Y.

NOLAN, NOLAN & STERN, ARCHITECTS, ROCHESTER.


BELT COURSE CONTINUES ACROSS BACK OF BALCONY RAIL
DETAIL OF MAIN ENTRANCE
FIRST STORY WINDOWS
THIRD STORY WINDOWS
SECOND STORY WINDOWS

DETAIL OF EUREKA CLUB BUILDING ROCHESTER, N. Y.

NOLAN, NOLAN & STERN, ARCHITECTS, ROCHESTER.

ANNUAL CONVENTIONS.

THE NATIONAL BRICKMAKERS' CONVENTION.

THE Eighth Annual Convention of the National Brickmakers' Association of the United States, held in the Auditorium, Chicago, beginning Jan. 23, and continuing through the week, certainly must have been productive of results gratifying to the committee having the affair in charge, and the some three hundred and fifty members of the Association who were present.

Chicago's reputation for hospitality, and doing things generally on a broad and liberal scale, was well taken care of by Messrs. D. V. Purrington, W. H. Alsip, W. D. Gates, and others of the committee, representing the Chicago craft, whose special purpose it was to extend visiting members a royal welcome; while the convenience and general well-being of all were as usual looked after by that prince of good fellows, Theo Randall, secretary of the Association, who, by the way, is the William H. Sayward of the brickmakers' craft.

The banquet was a grand affair, which must have taxed not only the Chicago brethren's purses, but the resources of the Bonifaces who hold forth at the Auditorium.

The postprandial exercises were made particularly brilliant by the speech of R. B. Morrison of Rome, Ga., who, in the absence of George M. Fiske of Boston, responded to the toast, "The Old North and the New South," in a very eloquent manner; while Hon. Anthony Ittner of St. Louis rendered, in masterly style, Knox's poem, "Oh, Why Should the Spirit of Mortal be Proud?"

The toast, "The Ladies," was well taken care of by W. D. Gates of Chicago, whose droll, characteristic style has made him a great favorite as an after-dinner speaker at these annual feasts.

The business meetings held during the week were characterized by harmony and good-feeling throughout, and the close attention given by members to the several very excellent papers read, some of which we reprint in another column.

In fact, the interest manifested by members in the open discussions which followed the reading of these papers; the character of the remarks, in many instances taking the form of experiences which had been productive of good or poor results, intended as they were to be of assistance to fellow-manufacturers; the free exchanging of ideas and suggestions; the complete devotion to their profession; and the manifest desire of all to improve their own methods, and be in every way up to date,— stamped the members of the National Brick Manufacturers' Association as progressive, broad, and liberal, and well worthy to look after the interests of the coming building material.

CONVENTION GOSSIP.

'Rah for Chicago and Chicago hospitality!

Presidents may come, and presidents may go, but Secy. Randall goes on forever. Selah!

Messrs. Chesholm, Boyd & White had the winner of the blue ribbon on exhibition.

No need to send out for a chaplain when Mr. W. A. Endaly of Cincinnati is present.

We print in another column the very able paper by Joshua Miller of Phœnixville, Pa., on enamelled brick as compared with glazed.

We are indebted to Mr. D. V. Purrington, chairman of the Reception Committee, for many courtesies extended.

The century card of the Wallace Manufacturing Company, Frankford, Ind., was quite the taking thing of the convention.

There was no doubt in the minds of many that brick is the coming paving as well as building material.

Pres. W. H. Alsip is a college-bred man, who gave up the practice of law to enter the brick manufacturing business.

The brick paving in some of the larger Western cities has proven to be in every way superior to other paving materials used.

Many ladies, wives, and daughters of the members were present during the convention, and we agree with the gentleman from the South: they should have attended the banquet.

Congratulations to A. S. Blaffer, of New Orleans, the genial third vice-president, upon his escape from serious difficulty into which he was led by his characteristic gallantry.

First Vice-Pres. Edwin McGraw of Pittsburg presided very gracefully in the absence of Pres. Alsip. He is well placed in the line for promotion.

The exhibit of J. W. Penfield & Son of Willoughby, O., must have been made at quite an expense. But we are told that the results were quite satisfactory.

New Haven was well represented by J. Wheaton Stone of the McLargon Brick Machine Company, Capt. S. P. Crafts, and Isaac L. Stiles. Mr. Stiles has the honor of being second vice-president for the ensuing year.

Mr. Frank B. McAvoy, of the firm of T. B. McAvoy & Sons, brick manufacturers of Philadelphia, offered to pledge his concern for one thousand dollars towards the establishment of a course of technical education at some college or university as a preparation for the clay-working business.

Each year one of the ablest men is selected president. It is certainly wise to continue these men upon the executive committee after the expiration of their terms as president, as it thereby insures the best interests of the association being well taken care of.

The relative merits of the Simpson Brick Press and the Boyd Press formed a never-ending topic for discussion between young Simpson and John Maroney. When we left Chicago, neither had succeeded in convincing the other that he was wrong.

THE NATIONAL ASSOCIATION OF BUILDERS.

ON Tuesday, Wednesday, and Friday, Feb. 13, 14, and 16, the Eighth Annual Convention of the National Association of Builders was held at Cotillion Hall in the Mechanics' Building, Boston. The first day was largely taken up by routine business, but was characterized by Secy. Sayward's very able report, Mayor Matthews's address of welcome, and some lively discussion. After the committee on credentials had reported, it was found that ninety-five delegates were on hand. The important matter of the afternoon was the secretary's report, a long but very well prepared one, setting forth clearly the work of the association, and suggesting sundry directions for improvement. A motion to refer the report to a committee brought a Mr. McCarthy, of Chicago, to his feet, with a general denunciation of the association, and particularly its secretary, in the course of which he defied any member to name a single thing the association had accomplished. This brought Mr. Anthony Ittner up, but Mr. McCarthy insisted upon holding the floor, and before Mr. Ittner secured the chairman's recognition Mr. McCarthy had been apologized for by Mr. Stevens of Philadelphia, and his remarks had been repudiated by Mr. Ginderle, another delegate from Chicago. Mr. Ittner then took the floor, and made a very forcible criticism of Mr. McCarthy's position. The remainder of the afternoon was taken up with a large number of resolutions and reports. We regret that lack of space does not allow of our printing the secretary's report; but as it will be printed by the association, and published in other journals, we would refer our readers to these, with the remark that it is a paper well worth looking up and reading.

WEDNESDAY SESSION.

The chief topic for discussion during this session was arbitration, Hon. Carroll D. Wright, United States Commissioner of Labor, giving an address on "The Relations of Employer and Workman."

DETAIL OF EUREKA CLUB BUILDING, ROCHESTER.
NOLAN & STERN, ARCHITECTS, ROCHESTER.

The attendance was a little larger than the day before, some snowbound delegates having reached the city. The first business of importance was a resolution introduced by Mr. Watson of Philadelphia, on the death of Col. Richard T. Auchmuty, the founder and maintainer of the New York trade schools. Mr. McCarthy of Chicago, Mr. Harris of Philadelphia, Mr. Wright of New York, Mr. Ittner of St. Louis, Mr. Blair of Cincinnati, and others eulogized Col. Auchmuty. Resolutions were also adopted on the death of James Boland of Buffalo, N. B. Hussey of Omaha, Hugh Sisson of Baltimore, and B. D. Whitcomb of Boston.

After the intermission for lunch, Hon. Carroll D. Wright was introduced.

MR. WRIGHT SPOKE

in favor of arbitration, but called attention to the fallacies of compulsory arbitration. He outlined the difference in the labor question between the present time and a generation ago, when it was merely a matter of wages and time. To-day it involves many important considerations, psychological, sociological, and industrial. It is a question which reaches every interest of man, which is as many-sided as the minds of men. Therefore, it is necessary to devise some method of harmonizing different bodies to one line of action; hence the value of true arbitration. With all that has been said of compulsory arbitration, it is a step backward. It means the enslavement of all the personal elements of industry. It would result in a more narrowing system than the Feudal. It means the development of the fighting nature of men. It means the death of industry. True arbitration brings men together for the purpose of comparing views and settling difficulties. It dignifies and ennobles industry, and embodies in its principles the reciprocal relations of men. To establish arbitration is to elevate the reciprocal relations to a plane of mutual recognition of the rights of all.

Individualism, which was the ruling spirit years ago, is supplanted by altruism. We have developed from a condition of fixed relation to one of contract, by which a workman can make such an arrangement as he chooses. Labor difficulties cannot be settled until each man recognizes the rights of the other man. The time is coming when neither party to a strike or lockout will feel that he is doing the right thing. Mr. Wright described the methods of compulsory arbitration and gave many illustrations to show its fallacy. He said that our mechanics have been taught they are free; they have been taught the principles that surround governments; they have been studying economic relations. Notwithstanding the objectionable features, one must recognize that in strikes and in lockouts there is much that is right on both sides. This results from the attempt of man to get the best of what he can out of his environment. "You should have a perpetual court of arbitration, to which you can refer. If you have a judiciously selected board of members on both sides of the great problem of industry, you have taken a great step towards the right; for you have recognized the rights of men, and those men have become just so much better as a result."

IN THE DISCUSSION WHICH FOLLOWED

Mr. Harris of Philadelphia said that the experience there was strongly in favor of arbitration. He instanced the good that had been done in the case of an association of bricklayers, independently organized, which had been brought to recognize the benefits to be derived from arbitration, after causing the builders no end of trouble by sudden strikes. There had been no friction since. Mr. Harris thought the workmen had more right to organize than the builders. Mr. Ginderle thought it became the employers to make more concessions than the employees did. He stated that in Chicago there had not been a masons' strike since 1887, when they first began to arbitrate. He advised arbitration before, not after, the difficulty. Mr. Blair of Cincinnati, chairman of the committee on arbitration, urged the formation of the several trades in each city into compact organizations, which could treat successfully with the men in their employment, who are strongly organized.

Mr. Sayward then explained

THE FORM OF ARBITRATION

of the association, and said he introduced it in order to bring out any suggestions leading to its improvement. He said the spirit of the agreement was the spirit of Mr. Wright's address, and asked why exchanges have done nothing with the agreement, which was the careful work of a capable committee. The convention ought to endorse it and instruct the filial bodies to introduce it. Mr. Hussey announced that he was in full accord with the spirit of arbitration, but wished to make the point that arbitration had no business to concern itself with the right of a non-union man to work, which was guaranteed him by the Constitution. He was in the same position as at the first session of the association. He held that no man and no body of men, whether master builders or union organizers, have the right to say that men shall not have the right to work, or that men shall not have a right to learn a trade.

Mr. McCarthy of Chicago was again heard from, as he promised the convention the day previous he should be.

Mr. Woodbury spoke with two years' experience on the arbitration committee, which has treated with bricklayers', stone masons', and laborers' unions. To his mind the form of arbitration proposed was the best way of settling all vexed questions that came before the board. There had been no strikes or lockouts of importance since the committee had been in existence.

Mr. Baker presented a resolution to the effect that delegates should urge upon their respective bodies the adoption of the association's form of arbitration. This was seconded by Campbell & Hopper of New York, with favorable instances of the force of arbitration, also by Mr. Sayward, and unanimously carried.

A large number of resolutions was referred to the committee on the same. Greetings from the National Association of Building Inspectors, in session at Steinert Hall, were received; and a vote of thanks was passed to the Massachusetts Charitable Mechanics' Association for the use without pay of Cotillion Hall.

FRIDAY'S SESSION.

VOLTA BUREAU BUILDING. BALUSTER.

This, the closing day of the convention was in many respects the most important, as the subjects of trade schools, the uniform contract, and the per capita tax were considered, and the election of officers was held.

Mr. Watson of Philadelphia and Mr. Ittner of St. Louis presented resolutions recommending the establishment of trade schools, Mr. Ittner asking members to obligate themselves to give young men graduating from such schools a finished trade in event of proscription by trades unions. Resolutions were finally adopted to the effect that the character of the work of the National Association is largely educational, and should not be limited to any one class; that the trades unions display antagonism to the association's plan for educating apprentices primarily on account of lack of understanding of trade schools; that the National Secretary be instructed to prepare a description of the plan, setting forth the fact that the time occupied by a course of trade training shall be deducted from the full term of apprenticeship, and that the remainder of the term shall be served in acquiring the necessary manual dexterity; that proper means for the distribution of this description among the workmen be taken, and that their co-operation with employers be urged in the establishment of trade schools.

The Uniform Contract was discussed with considerable vigor,

but some of the speakers seemed to overlook the fact that there are two parties to every contract. For instance, Mr. Grace of Chicago thought amendments should be made without reference to the American Institute of Architects. The latter might kick, but they would have to come to terms finally. But in the majority of cases the speakers thought that the aim to secure in this contract was a thoroughly fair relation between the parties in a building contract. The matter was discussed until the dinner in the lower hall grew cold, and finally tabled. Mr. Sayward suggested that if all delegates who had suggestions to make would send them in writing to the committee much good would be accomplished. After all, as Pres. Hersey remarked on opening the discussion, the action of the convention was prescribed. The only action which could be taken was to recommend the delegates to the joint committee on uniform contract to urge the adoption of changes which, after discussion, were approved by the convention.

A vote on the per capita tax resulted in the adoption of three dollars by a small majority. Secy. Sayward favored reduction to two dollars on account of hard times, and offered to work for a fraction of his present salary to reduce expenses so that the lower tax would suffice.

Mr. Wingate introduced a resolution restricting immigration, which was opposed on the ground that the American boy can look after himself, and finally tabled.

The election of officers resulted as follows: President, Noble H. Creager of Baltimore; first vice-president, Charles A. Rupp of Buffalo; second vice-president, James Meathe of Detroit; secretary, William H. Sayward of Boston; treasurer, George Tapper of Chicago.

Mr. Creager, the president, belongs to the large brick manufacturing firm of Pitcher & Creager of Baltimore. He is the president of the Baltimore Exchange, and is very prominent in Baltimore business circles.

Mr. Meathe is a plumber, and president of the Detroit Exchange.

It was voted to hold the next convention at Baltimore on the third Tuesday in October, 1895. In the evening a smoker was given by the Boston Exchange, and delegates and visitors royally entertained. A banquet to the visiting ladies was held the same evening at the Vendome.

COMMISSIONERS AND INSPECTORS.

THE fifth annual convention of the National Association of Commissioners and Inspectors of Buildings was opened at Steinert Hall, Boston, on the morning of the 13th of this month.

Pres. John S. Damrell of Boston was in the chair. Mr. J. J. Barry of Boston presented a paper on the "Responsibilities, Qualifications, Duties, and Powers of Building Inspectors." In this Mr. Barry stated that a building inspector should have the same power to arrest transgressors of the law that a police officer has. Such power, he claimed, would make a man conservative, and injudicious use of it would be suitable cause for his removal.

Several inspectors stated that they had similar powers, and could at any time arrest work on a building, and that no building could be erected without their permission.

Inspector Entwistle of Washington read a paper on the buildings of that city, which was followed by a paper on the "Tower Fire Escape" by Mr. William J. Gillingham of Philadelphia. This was essentially the same paper contributed by Mr. Gillingham to our last month's number, and its discussion occupied the remainder of the morning session. It was received very favorably, and strongly endorsed by many of the inspectors. The subject of this form of escape will be further considered in future issues of THE BRICKBUILDER, in the department devoted to fireproofing. At the afternoon session Mr. Fitzsimmons read a paper on the "Relation of the Architect to the Building Department," which was warmly approved by the convention.

On Wednesday the Arsenal at Watertown was visited and the big testing machines inspected. Bunker Hill and the Navy Yard were taken in on the way back.

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

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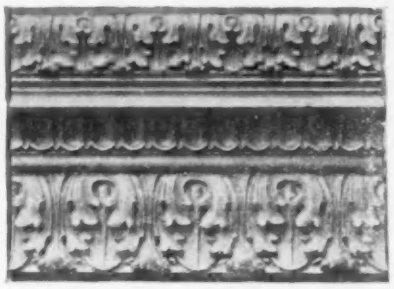
CROWN MOULD. VOLTA BUREAU BUILDING.

WE wish many of our architectural readers who are possessed with the idea that the brickmaker is very little higher in the industrial scale than the day laborer could have attended the Chicago convention. They would have found there as fine a body of representative business men and manufacturers as any industry in the United States could show. The brickmaker of to-day is a manufacturer in the highest sense of the word. Producers of lumber and stone, raw and finished, have comparatively few of the difficulties to contend with that the manufacturers of clay goods are constantly meeting. The obstacles of this industry, in forcing the manufacturers to overcome them, have developed a class of self-reliant, successful men that everywhere hold leading positions in the industrial world.

BELT COURSE. VOLTA BUREAU BUILDING.

WE also wish to invite our architectural readers to read carefully the papers by Mr. Miller and Mr. Engle, on glazed and enamelled brick, published in this issue. What is therein contained is of vital importance to every architect, as the necessity for using glazed materials is increasing day by day. It can be said in this connection that

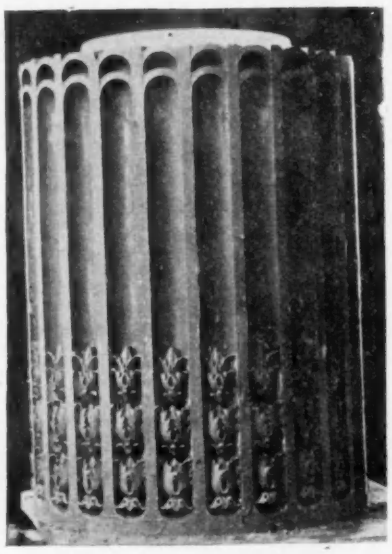


CORNICE OVER FRONT ENTRANCE DOOR.

these papers held the attention of the convention in a manner which proved beyond question the soundness of the views put forth in them.

THE desirability of some course in technical education as a preparation for the clay-working business has often been advocated in these columns, and we are pleased to note that the Chicago convention considered it with decided favor. Mr. Orton's paper, which preceded the discussion, is published in full in this issue, and ably sets forth the reasons for such a preparation and the ways in which it may be useful. It is a matter that we recommend to the governing bodies of technical schools, with a suggestion to look into the extent of the clay-working industry. We can think of no other representing so large an investment of capital, and so great a value of products, for which preparation is not provided by some one of the technical or scientific institutions; and yet it is an industry where special knowledge is indispensable.

IT is encouraging to note that the sentiment of the National Association of Builders was opposed to the views advanced by some speakers when the uniform contract was under discussion, to the effect that the American Institute of Architects should be forced to come to terms and accept changes introduced by the Builders. This appears to us not only a one-sided, rather pig-headed way of looking at the matter, but one that is absolutely foolish, in that the architects have, and probably always will have, the whip hand. Competition is so strong that architects will have no difficulty in securing honest and capable builders to take contracts, the terms of which are fair. The view of Mr. Grace of Chicago should have been condemned by the National Association. It throws out the question of fairness altogether, and we are led to wonder whether Mr. Grace has not run up against some architect who insisted upon a contract being carried out according to specifications.



DRUM OF COLUMN. VOLTA BUREAU BUILDING.

COMMUNICATION.

EDITORS OF THE BRICKBUILDER:

Dear Sirs, — In reading Mr. Boyden's article on "Hollow Brick Walls," in the December number of your paper, I was impressed by the following statement, and particularly by the part printed in italics (which are mine): —

"From exhaustive tests made during the building of the Allegheny County Court House and tower, — a most important work, the tower being three hundred and twenty feet high, — it was ascertained hat the strength of brick built in walls or piers is very nearly one third of the crushing strength when crushed between smooth surfaces, or imbedded in plaster; so that, in work where it is necessary to be near the margin of safety, *it may be assumed that well-laid brickwork will carry in a wall one third the crushing strength of a single brick*."

It would prove interesting reading to many of your subscribers, I think, if a description of the above-mentioned tests were given, as the conclusions based upon them are certainly at variance with other tests and the practice of engineers. It may be that part of the brickwork in the above-mentioned tower carries twenty-four tons per square foot, although it seems improbable; and in any case, I do not think it is a safe load to place upon even the best of brickwork.

As the assumption of Mr. Boyden, printed in italics, is certainly contrary to results obtained from a large number of tests made on the crushing strength of brick and brick piers, at the United States Arsenal at Watertown, Mass., and as the general tendency of Mr. Boyden's article is to attribute a greater strength to brickwork than seems to be warranted, I would like to call attention to the following facts, which have been developed from various tests made on the strength of bricks and brick piers.

First. In the tests on the strength of seven brick, published in Mr. Boyden's article, it should be noticed that in every case the brick *cracked* under less than one half of its ultimate strength, and brick No. 3, which, was next to the strongest of the seven, cracked under only thirty-five per cent of its ultimate load. The same condition is shown by nearly every set of tests on the strength of brick that I have seen.

Second. Tests on brick piers built of Sand's Cambridge (Mass.) brick (the results of which are given on page 178 of the *Architects' and Builders' Pocket-Book*, ninth and later editions) show that the strength of carefully built brick piers averages one tenth of the strength of a single brick, when built of common brick, in lime mortar, and about one sixth when built of pressed brick.

Piers built of common brick in Portland cement mortar were one fifth stronger than those laid up with lime mortar.

Besides the small ratio which the strength of the pier bore to the single brick, every one of the piers built of common brick commenced to crack under a load of less than one half of its ultimate load, so that the cracking strength per square inch of the piers built of common brick in lime mortar only averaged about one twentieth of the strength of a single brick. But we do not wish our piers to crack, and it would hardly be considered safe to load a pier to more than one third of its cracking strength, or *one sixtieth* of the ultimate strength of a single brick.

The average crushing strength of the seven bricks given in the table quoted by Mr. Boyden is approximately eighty-three hundred pounds per square inch, and one sixtieth of this would give one hundred and thirty-eight pounds per square inch for the working strength of the brickwork, or nine and nine tenths tons per square foot.

This value is a little more than that generally used by engineers for brickwork in lime mortar, or that given in the recent building laws.

The following tables give the greatest allowable load for brickwork, as specified in the Boston and Chicago building laws.

Boston Law. — Maximum load in tons per square foot: —

	Walls.	Piers, 6 to 12 Diameters.
Brick laid in cement and sand, 1 to 2	15	13
" " " cement, lime, and sand, 1, 1 and 8,	12	10
" " " lime mortar	8	7

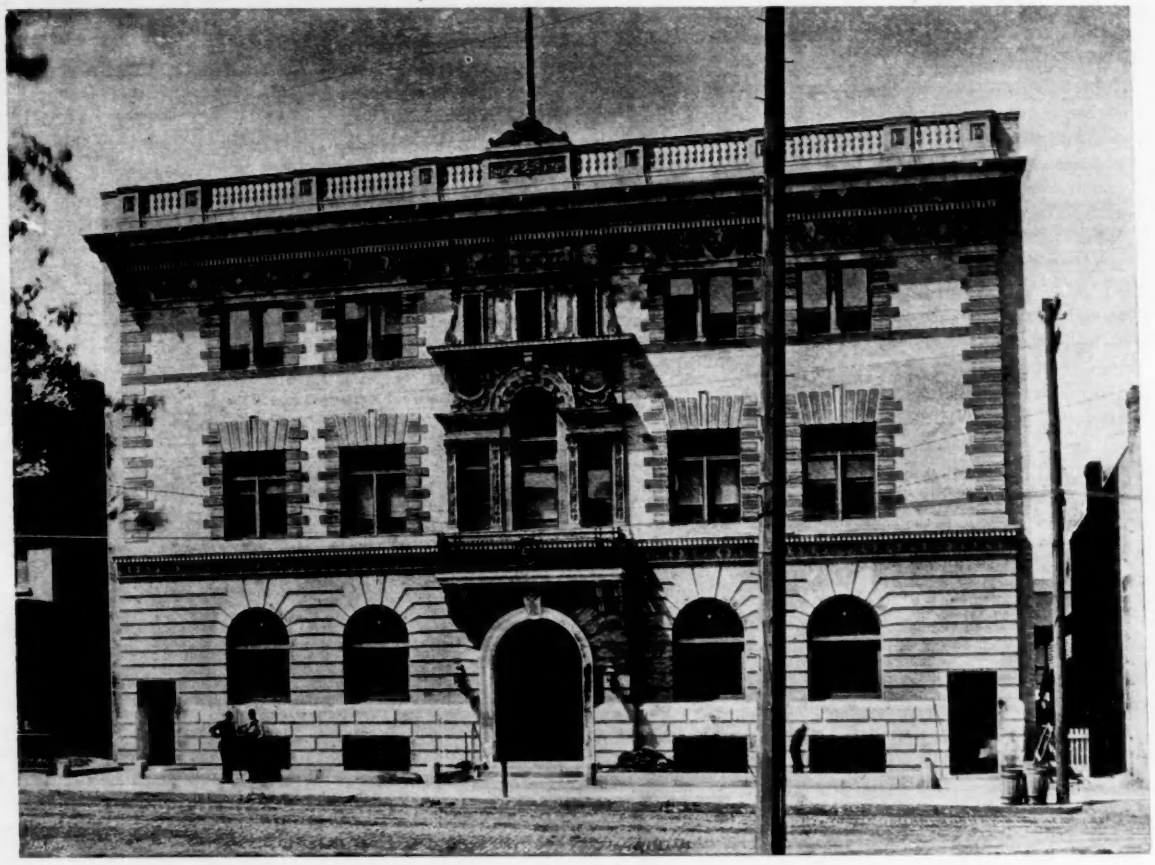
Chicago Law. — Maximum load in tons per square foot for brickwork in walls: —

Brick laid in standard cement mortar	12½
" " " ordinary cement mortar	9
" " " lime mortar	6½

On page 181 of the *Architects' and Builders' Pocket-Book* (ninth and later editions) the writer gives values for the working strength of brickwork, which agree very closely with the above.

Regarding the advantages of hollow walls, I believe them to be better than solid walls, when bonded with metal ties, and when not exceeding three stories in height; above that height I should prefer to use solid walls, lined with terra-cotta furring blocks.

F. E. KIDDER.



THE EUREKA CLUB, ROCHESTER, N. Y. MESSRS. NOLAN, NOLAN & STERN, ARCHITECTS, ROCHESTER.

SEE PLATES 14, 15, AND 16, ALSO DESCRIPTION BELOW.

THE ILLUSTRATIONS.

PLATES 9, 10, 11, 12, and 13. ELEVATIONS AND DETAILS OF THE VOLTA BUREAU, Washington, D. C. *Messrs. Peabody & Stearns, Architects, Boston.*

This is one of the richest examples of terra-cotta work in this country. The ornament is not only well designed but admirably applied, and made to count for something by the plain, unbroken surfaces of the walls. Just what the detail is may be seen by the photographs reproduced on the preceding pages, which show nearly every decorative feature on the building. The terra-cotta work was executed by the Perth Amboy Terra-Cotta Company. The bricks from which the building is built were made by the Partridge, Powell & Stone Company, the corporate name of which was on Jan. 31 changed to the Excelsior Terra-Cotta Company. This company now combines the manufacture of architectural terra-cotta, in all colors, with the special colored front brick that has heretofore been its principal product, thus enabling architects to purchase brick and terra-cotta of one factory, insuring a successful combination of colors as well as avoiding the annoyance of making two contracts for materials so closely related. Our best wish to the Excelsior Terra-Cotta Company is that the same success attend this combination that has characterized a similar combination in other cases. The company's offices are at 105 East 22d Street, New York.

PLATES 14, 15, and 16. ELEVATION AND DETAILS OF THE EUREKA CLUB BUILDING, Rochester, N. Y. *Messrs. Nolan, Nolan & Stern, Architects, Rochester. Drawings by J. Mills Platt.*

There may be many larger and more extravagantly furnished clubs than the Eureka of Rochester, but there are few more complete and thorough in their appointments. From top to bottom every care has been exercised by the architects to get the most perfect results; and, as the fame of this building is already established, we have gone to considerable trouble to secure the names of the more important sub-contractors, that our readers in that section of the country may profit by the information when they have similar work which requires careful and conscientious execution.

First that claim attention are the materials of clay from which it is made. The Peerless Brick Company of Philadelphia furnished all front and special shape brick, as they have already done for a long list of buildings throughout New York State. The rich terra-cotta detail was executed by the Corning Terra-Cotta Company of Corning, N. Y., and is the best kind of evidence that this company is in line for the best class of architectural terra-cotta.

The Rochester Brick and Tile Company furnished the common brick, tile, etc. The mortar of the front brick and terra-cotta work is buff, colored with the mortar color made by the Ricketson Mineral Paint Works in Milwaukee, Wis.

Messrs. Whitmore, Ranler & Vercinus of Rochester supplied the cement manufactured by the Buffalo Cement Company, and also laid the cement walks and cut and finished the Gouverneur marble.

Messrs. A. Freiderich & Sons, 601 Ellwanger & Barry Building, and F. C. Seitz, 605 same building, did the general and mason and the carpenter contracting, respectively. The Messrs. Freiderich are also the contractors for a new $70,000 building on Platt Street, Rochester, for C. B. Woodworth.

The Tennessee marble wainscot, lavatory tile floors, tile and Pompeiian brick fireplaces and fittings, were furnished and set by J. C. Barry, 49 North Street.

Of the iron work, the structural was done by J. J. Young of Rochester, the ornamental by the Winslow Brothers Company of Chicago.

The inside finish and mill work was contracted for by John A. Smith, 175 Exchange Street, and the furniture was specially designed and made by the Hayden Furniture Company of Rochester.

It is upon them and the other interior furnishers given below that much of the success of the club depends; for the furniture, draperies, carpets, chandeliers, etc., in the large reception, dining, and ball rooms, the ladies' parlors, and the general club rooms, produce the strongest impression upon members and visitors. With the two above-mentioned houses must also be catalogued Howe & Rogers of 80 to 84 State Street, who put in the carpets and rugs; Gorton & McCabe, 43 State Street, who furnished the draperies and hangings; Albert Will, 28 Exchange Street (C. K. Summerhays, manager), from whom the gas and electric features were secured; Hamilton & Mathews, 26 Exchange Street, who supplied the hardware (a very important part of a fine building); and Henry Waltjen of 38 Exchange Place, who did the painting and decorating.

Of course the Graves elevators were put in, for why go away from home to get work other cities send there for? The same company also furnished the dumb-waiter service.

In a well-appointed club building like this there is much that is out of sight, often inaccessible, that must be put in to stay. One of the most important contracts of this sort is the electric instalment, for lighting, for bells, and often for power. Messrs. R. Schmitt & Co. of 51 East Main Street were intrusted with this work. The plumbing, while not inaccessible, is nevertheless a nuisance if put in so that access for repairs is often necessary, and the selection of W. G. Reid & Sons for such work as is here required is a decided compliment to their skill. Not less important is the steam heating, which was installed by Samuel Sloan, 24 Exchange Street: two boilers from the Sterns Manufacturing Company of Erie, Pa., and a large blower system by the B. F. Sturtevant Company of Boston, are the principal features of the plant.

Club men are good livers, and a club so well appointed in other respects as the Eureka must needs have a kitchen with every modern convenience. C. W. Trotter & Son, 46 North Clinton Street, Rochester, attended largely to this portion of the building, putting in a twelve foot, three-fire French range, copper cooking utensils, a carving-table, and a thirty-inch broiler. The refrigerators, meat boxes, and cool rooms were built in by the Wickes Refrigerator Company of Chicago. The firm of Goggan & Knowles, 50 Franklin Street, Rochester, did all the sheet metal work, and roofing.

One more feature needs to be mentioned, — the bowling-alleys and gymnasium in the basement; the former of the kind patented by Emil Reiskey of Rochester, and made with the gymnasium appliances by the Narragansett Machine Company of Providence, R. I.

The Eureka Club is about twelve years old, and has always been a prosperous, well-managed organization. It has at present 159 active members, comprising the best and most prominent of Rochester Jewish citizens. Mr. Abram Dinkelspiel is the president.

MESSRS. FISKE, HOMES & CO. treated the delegates to the National Builders' Convention to a very fine display of their specialties. There were three very noticeable things in the way of faience that attracted marked attention, — a large mantelpiece, a panel similar to the ones used in the Reading terminal at Philadelphia, and a frieze and ceiling decoration. Smaller pieces were advantageously displayed, so that, with the faience counters and railings that are a part of their office furniture, this material received a good demonstration of its possibilities. In the line of fire-flashed and Pompeiian terra-cotta some interesting exhibits were shown, and the application of Pompeiian bricks in special sizes to the construction of fireplaces was illustrated by several carefully built examples in varying shapes and sizes.

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THE AGE OF CLAY AND STEEL.

AT the banquet given by the Chicago Association to the National Brick Manufacturers' Association, the following toast by Mr. W. L. B. Jenney of Chicago calls for a leading place in this department: —

"*Mr Toastmaster, and Gentlemen of the National Brick Manufacturers' Association*, — 'What is a brick?' was the favorite question with a celebrated French professor of engineering, whom I once knew. His students soon 'caught on' to the only answer that the old gentleman would accept, under any circumstances.

"'A brick is a parallelopipedon of baked earth.' Any other form was terra-cotta. For him there was no such thing as an ornamental brick.

"I am informed that your society entertains a much broader view, and admits in its membership all the manufacturers of clay for building purposes. Those of you who are not so fortunate as to be residents of Chicago no doubt have remarked sundry peculiarities in our city. Most notable, perhaps, is the extreme modesty of the Chicago citizen. This is no joke.

"When a Chicago capitalist or a Chicago syndicate decide to erect a big sky-scraper, they do not brag about it for months, attracting attention to themselves on account of their wealth and their enterprize. Their modesty is such that the first intimation they give the public is a notice in the real estate column of the Sunday papers of a transfer of a big block of property, a cut and description of the building, and the name of the fortunate architect.

"The next morning, when that architect reaches his office, he will find waiting for him the representatives of the brick manufacturers of the neighborhood, each anxious, then and there, to make a contract for the brick of that building.

"Chicago is always short on time. We cannot afford to put a lot of stone-cutters at work pecking away at big blocks of granite, and spending two or three years in the erection of a building. The carrying charges are so enormous, consisting often of the interest on more than two millions of dollars, besides taxes, insurance, etc., that the whole thing must be done in twelve months from the turning out of the old tenants, the tearing down of the old structure, the erection of the new, to the installing of the new tenants, that a revenue may begin. We must have materials that can be manufactured by machinery; great quantities in a very short time. Clay and steel adapt themselves most admirably to these requirements. We must have a style of construction that can be erected rapidly, and so arranged that if the terra-cotta of the lower stories is not ready, which is usually the case on account of the excess of work in these stories in the shape of columns and other ornamentation, the setting of the terra-cotta can commence in the second or third stories without waiting for those below. The Chicago steel skeleton construction meets these requirements.

"In these tall buildings the skeleton is of steel. The walls, the floors, the partitions, are carried story by story, each story independently on the columns. The carrying lintels and brackets are wrapped around with clay in the shape of ornamental string courses and medallions. Terra-cotta pilasters cover the exterior columns. The plain surfaces are filled in between with pressed brick or terra-cotta ashlar. The whole is backed up with clay in the shape of common brick. The floors are of steel beams filled in between with hollow clay arches. The partitions are of clay tile. The fire-proofing is of clay. The whole is cemented together with another form of clay, for cement is little more than clay roasted and ground. So that we are entering upon a new building era, — an era of clay and steel. There was a stone age, — an age of savagery. Then followed a bronze age, — an age of barbarism. Then came the iron age, — the age of civilization. And now we enter upon an age of steel and clay, — an age of science, an age of advanced civilization, in which the technic arts are making most enormous strides.

"These great buildings of clay and steel are in every respect superior to the old style of masonry construction. They are fire-proof, cyclone-proof, and earthquake-proof. They are very substantial, and, moreover, are economical. These buildings are calculated and designed with the same science, the material is inspected with the same care, the construction is superintended with the same thoroughness, as in a great railway bridge of the first order across the Mississippi or Niagara. To some extent these buildings resemble the human figure. The bones and the sinews are of steel, the flesh and the ornamental exterior of clay. All the art, all the architecture, and all the beauty are in the clay. That this society should have chosen rather the beautiful exterior instead of the bones of the structure is easy to comprehend; one has only to glance around the room. By way of illustration, permit me to say that I am sure that there is not one of you but what would choose rather the rosy cheeks and coral lips of a beautiful, blushing maiden in preference to her bones."

THE *Wall Street Daily News* says that cheap building materials, principally those which go to make up a fireproof building, are causing an epidemic of tall office and apartment buildings. Ten years ago a strictly fireproof building would cost fully two dollars per cubic foot. But, with improvements in manufacture, the cost of steel for the framework and hard or porous terra-cotta for covering has steadily dwindled until the cost is now only about thirty-five or forty cents per cubic foot. Taking Mr. Kidder's recent article in the *American Architect* as authority, this is an adequate figure for a strictly fireproof building, that is not extravagantly decorated on interior and exterior. Of such buildings we can select, as fair examples, the Auditorium, Chicago, costing thirty-six cents; the Stock Exchange in the same city, 33.2 cents; the Schiller theatre, also in Chicago, 30.8 cents. These are all by Adler & Sullivan, who, like other prominent Chicago architects, are past-masters in the art of fireproof construction. Taking these as a basis, it is not unreasonable to place the cost of the average steel frame fireproof building at thirty cents; for it is not likely that materials will increase in cost. On the other hand, it is more than likely that their cost will be still further reduced. According to Mr. Kidder's figures, this is only twice the cost of a good-sized brick house with ordinary finish. A house, however, could be rendered practically fireproof with much less expense than a large office building, provided special materials did not have to be made.

As yet, however, judging from published lists of various fireproofing companies, only an occasional residence has been built of fireproof materials. In the construction of residences porous terra-cotta is particularly suitable. It is extremely light, a non-conductor, can be cut with edged tools, and holds nails and screws. As a protection to wooden construction it is admirable, and it can be made in slabs or boards, which can be cut to fit any desired space, and nailed into place, the plastering covering and protecting the nails.

Porous terra-cotta seems easily enough made, but those who attempt its manufacture with ordinary brick clay are pretty certain to meet with failure. The successful manufacturers use *fire clay* with some combustible material, usually sawdust. With a clay that vitrifies at a low heat there is danger that the combustion of the sawdust will generate heat sufficient to vitrify easily burning clays, and the product will not possess the desired spongy or porous character. We firmly believe that thorough methods of fireproof construction will extend in a short time to the better class of residences. In large warehouses, where it is of the greatest importance, the tendency is still to reduce expense by the use of certain methods of slow-burning construction. These are almost as expensive, if carefully carried out, as thorough fireproof construction; and they seldom serve to save the building when a fire once gets started. It can be said in their favor that they are less a menace to surrounding property, but they are seldom successful in saving themselves or their contents from destruction.

TRADE NOTES.

WE were glad to note at the convention that the subject of enamelled bricks received a good share of attention, and much general interest was shown in the discussions that followed upon the subject; also the disposition of our manufacturers to enter the field with an article equal in all respects to that of foreign make. The Tiffany Pressed Brick Company of Chicago are turning out an enamel brick that is receiving very favorable comment, being white and clear, with a highly finished surface and possessing great durability. They guarantee the brick equal in every way to any manufactured, not excepting the imported article.

IT is encouraging to note the increased popularity which fireproof construction is earning for itself, its use being extended to nearly all grades of buildings.

In response to the demand from the architects and owners for fireproofing adapted to residential purposes, the manufacturers are putting forth some new ideas that are meeting with deserved favor. We have had our attention called to the new one-inch hollow tile for partitions, etc., that the Pioneer Fireproof Construction Company are now putting on the market. These tiles are designed especially for residential work and flats where economy in space and cost is desired. The company report a rapidly growing demand for them.

WE note that the architects are giving more attention generally to selection of colors in mortar, and securing some very pleasing effects by proper choice. We feel that a great deal can be done in this direction, and are glad to know that it is interesting the profession more than formerly.

Some very fine specimens in mortar color are being put upon the market by the Ricketson Mineral Paint Company of Milwaukee, Wis. They claim absolute fastness of color in all their goods; also that their material can be handled forty-eight hours after mixture, not hardening in that time. The popularity of their brand would seem to warrant the claim. Besides the straight colors, they make a feature of special shades manufactured to order.

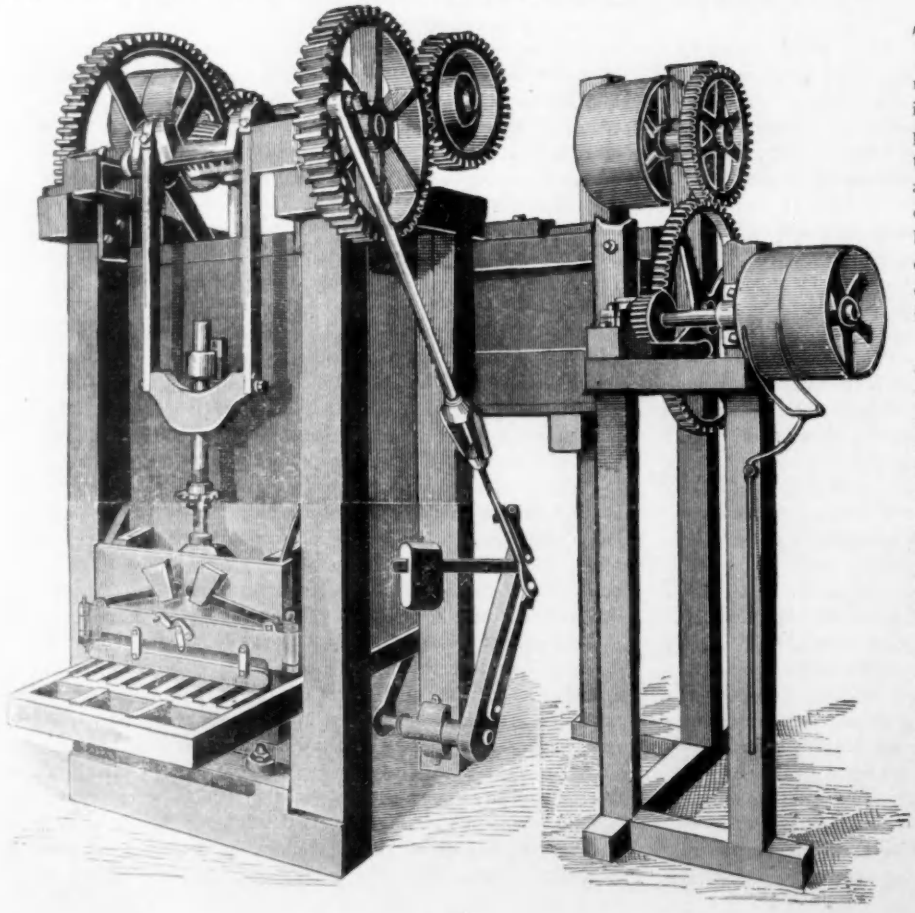
A handsome shade of their buff mortar color appears in the structure of the Eureka Club House, the half-tone print of which will be found on page 29.

ON page v appears the advertisement of the Simpson Brick Press Company. This concern are the manufacturers of the celebrated Simpson presses, and notwithstanding the financial depression report business as being good. They have recently constructed several large plants in the East, and are figuring on many more.

Those intending to embark in the dry press process of making brick would do well to correspond with this firm, as their machinery is well known to be of the highest quality. As further evidence of the superiority of their line, they were given nine points of advancement in dry press brick machinery by the official judge on that class of machinery at the World's Fair.

WE have recently had the pleasure of visiting the Chemical Sand Brick Works, owned by Mr. W. H. Lathrop, of Racine, Wis. It is a model plant of its kind, having all the latest improvements in machinery for the production of chemical sand brick, and this past year has turned out some half million handsome specimens of the same. Mr. Lathrop claims for these bricks all the virtues of a desirable building brick, laying particular stress on the quality of the increasing hardness of the bricks with lapse of time. He further states that he will guarantee them for any reasonable term of years. They are made in any desired design or color, and present a very handsome appearance wherever used.

Mr. Lathrop reports a growing demand for his production, and has some very flattering testimonials from architects and builders who have used his bricks.



THE cut on this page is a representation of the new, and latest improved brick machine, patented by George Carnell, having a horizontal pug mill attached, and a patent throw-out motion, which pushes out the moulds. When a mould gets caught, or a stone gets fastened in the machine, this catch will open, and thus all danger from breakage is avoided. It is superior to any other machine in use for taking the clay direct from the bank, tempering it, and making good, straight, and solid stiff mud bricks.

In the construction of this machine the aim of the inventor has been to relieve the crown wheel and tempering shaft of as much strain as possible. The result is that the crank shaft acts independently of the tempering shaft, thus distributing the strain on two vital movements. The benefit of this arrangement is apparent; the only work required of the pug shaft is the tempering of the clay, the motive power of the crank shaft being directly from the counter shaft; thus the machine is capable of working the clay very stiff without endangering the crown wheel or shaft. The machine is powerful, durable, and simple in its construction and does not require much skill in handling. The working parts are well protected from dirt and sand and can be easily duplicated. The plunger is regulated with a screw, thus insuring the greatest speed and exactness. Each machine is thoroughly tested before leaving the shop and is sold entirely on its merits.

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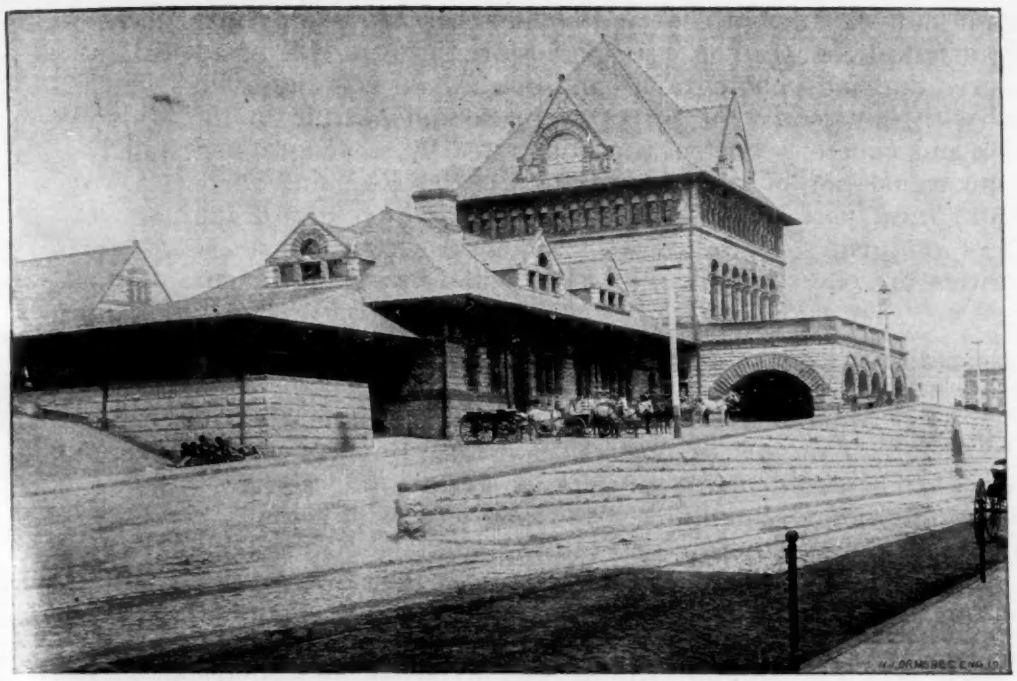

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OUR A B C

ARCHITECTS will find THE BRICKBUILDER well worth its subscription price in many ways. Modern American work in brick and terra-cotta, carefully selected from the best offices, will be illustrated by elevations and detail drawings in our plate department and by sketches and photographs accompanying our correspondence from leading cities. Old foreign work will be adequately illustrated by measured drawings, photographs, and upwards of 200 engravings which will be published in connection with our reprint of Street's "Brick and Marble in the Middle Ages." Roman methods of brick and concrete construction, illustrated by 100 engravings and 27 large plates, will be covered by our translation of "L'Art de Batir Chezles Romains." These two standard and famous books should form part of the library of every architectural draughtsman. They cannot be secured outside of our pages for less than $25.00. A strong line of up-to-date articles by acknowledged authorities on clay building materials will form a prominent feature of the paper.

BRICKMAKERS should be as much interested in the market for bricks as in their manufacture. THE BRICKBUILDER aims to benefit not only brickmakers, but manufacturers of terra-cotta, tiles for roofing, paving and decorating, fireproofing, flue linings, chimney tops, wall copings, crestings and finials, and all other constructive or decorative materials made of clay. To show every merit of these materials, to provide manufacturers with designs illustrating their use, to show them the buyers' views and give them general information that will assist them in enlarging their sales, is one of the chief aims of this paper. It will do everything possible to favorably influence architects and builders to use clay materials, and as its success will indirectly benefit every manufacturer, we earnestly solicit the support of their subscriptions.

CONTRACTORS and mason builders, especially those in towns where the professional services of an architect are not available, and where the designing and planning fall upon the builder, will find the details for the execution in common brick well worth the cost of the paper. Designs for fireplaces, cornices, chimney tops, belt courses, arches, panels, corbels and all other ornamental parts of a building, will be given in great variety, by practical working drawings. A special department for practical builders will be regularly conducted, and in this many new and good ideas for ornamental brickwork will be given.

THE BRICKBUILDER for 1894 will be one of the best and most profusely illustrated periodicals for its price in America. It is mailed flat to subscribers, and costs but $2.50 per year. The attention of draughtsmen in large offices and of students in architectural schools is called to the fact that very liberal discounts are made to clubs.

THE BRICKBUILDER PUBLISHING CO.,

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